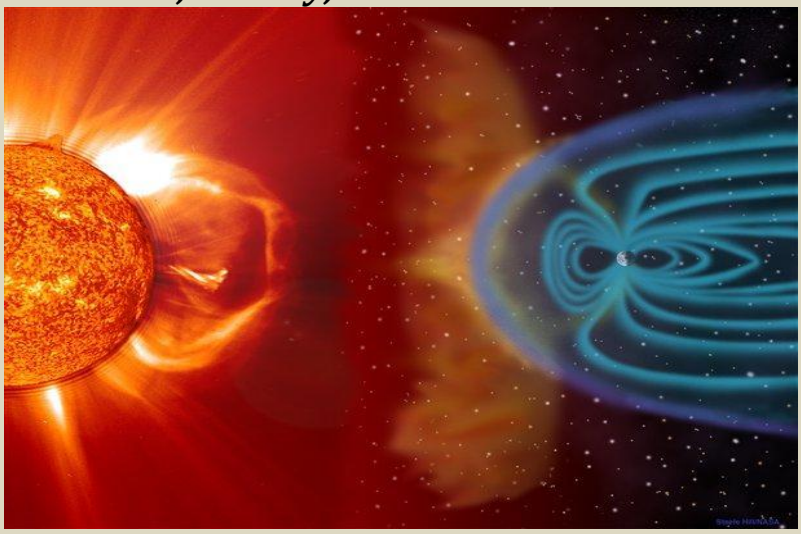
Oslo, Norway, 22 – 24 October 2012



Keynote Speakers

Biography and Abstract

TIEMS Oslo Conference

"Space Weather and Challenges for Modern Society"

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Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: **Pål BREKKE**, ***Ph.D.***

Position: ***Senior Advisor***

Organization: ***Norwegian Space Centre***
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0212 Oslo
Norway

Date of Birth: ***23.05.1961***

Nationality: ***Norwegian***

Mobile: ***+47-90871961***

E-mail: ***paal.brekke@spacecentre.no***

Biography:

Pål Brekke received a Dr. Scient degree in 1993 from the Institute of Theoretical Astrophysics, University of Oslo with focus on the ultraviolet (UV) emissions from the Sun observed with instruments on sounding rockets and the space shuttle Challenger. His work focused on dynamical aspects of the Sun and measuring variations in solar UV radiation. Since 1993 he participated in the Norwegian involvements in preparing the EUV spectrometers CDS and SUMER on Solar and Heliospheric Observatory (SOHO) and was in charge of developing analysis software for CDS. After the launch of SOHO in December 1995 he was part of the science operation team at NASA Goddard Space Flight Center. In 1999 he joined the European Space Agency (ESA) as the SOHO Deputy Project Scientist stationed at NASA/Goddard Space Flight Center. During this time was also in charge of outreach and media activities, making SOHO to one of the most well-known current satellite projects.

Currently he is a Senior Advisor at the Norwegian Space Centre. He is a Norwegian delegate to the ESA Science Programme Committee and a delegate to the International Living with a Star. He is a member of the board of University of Tromsø and an adjunkt professor at the University Centre in Svalbard. He received a Fulbright Fellowship in 1994, ESA´s Exceptional Achievement Award in 2002, Laurels for Team Achievements from the International Academy of Astronautics in 2003. He has served on several NASA Review Panels and as referee for various scientific journals. Professional publications: Refereed Journals - 45, Proceedings - 74, Popular Science - 34. Numerous appearances in national and international news-networks and is an acclaimed international lecturer.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Pål Brekke***

Title of Presentation: ***The Stormy Sun - From Kristian Birkeland to Space Weather Hazards***

Session: ***Welcome and Opening***

Abstract:

What is more beautiful on a cold winter night than catching a glimpse of the aurora borealis, “the northern lights”, dancing across the sky? This stunning phenomenon is embedded in the mythology of many cultures and has been characterized as everything from dancing spirits to God’s anger. But no one suspected a connection with the sun until a little more than a hundred years ago, when an eccentric Norwegian scientist, Kristian Birkeland, realized that the Sun bombards the Earth with particles.

Until about 100 years ago, solar storms could pass by without humans noticing the damage these storms do. Today it’s a different story. More than 1,000 satellites are operating in space and the loss of a signal from any one of them can have serious consequences on weather forecasts, communication, navigation, mapping, search and rescue, research, and military surveillance. Today satellites monitor the Sun, providing space weather forecasts and a reliable early warning about solar storms that may hit the Earth, so that satellite systems, electrical grids, and other services can minimize potential disruptions.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: **John N. Moura**

Position: ***Associate Director of Reliability Assessments***

Organization: ***North American Electric Reliability Corporation (NERC)***

Nationality: ***United States of America***

E-mail: ***John.Moura@nerc.net***

Biography:

John N. Moura is the Associate Director of Reliability Assessments for the North American Electric Reliability Corporation (NERC), where he joined in 2008. Mr. Moura now leads the electric reliability organization's efforts to independently assess and report on the overall reliability, adequacy, and associated risks of the interconnected North American bulk power system. Statutory long-term and seasonal reliability analyses incorporate continent-wide deterministic and probabilistic reliability incidences for resource adequacy, transmission planning, and comprehensive assessments of emerging risks.

He is the co-author of numerous IEEE and other technical research journal papers, as well as primary lead on NERC special reports including *Accommodating High-Levels of Variable Generation, Reliability Impacts of Climate Change Initiatives, and* this year's report on the *Effects of Geomagnetic Disturbances on the Bulk Power System*.

John coordinates the efforts of NERC's Planning Committee, which brings together the power industries leading experts on assessing reliability of the power grid. In addition, John is actively engaged in multiple groups across North America focused on the reliable integration of variable generation, demand response performance, smart grid initiatives, environmental regulations, and power system risk and vulnerability analyses. He also has provided subject matter expert testimony to federal regulators and provides technical support to congressional staffers related to bulk power system reliability. Mr. Moura earned his BS from Rutgers University.

John directs the advancement of NERC's Geomagnetic Disturbance Task Force, with a primary focus on understanding the effects of GMD on bulk power systems and guiding the industry to mitigate their effects to ensure reliability.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***John N. Moura***

Title of Presentation: ***NERC's Special Reliability Assessment: Effects of Gromagnetic Disturbances on the Bulk Power System***

Session: ***Expectations and Effects on Electric Power Supply and Oil and Gas Exploration Activity***

Abstract:

The highly complex, interconnected North American power grid has provided a long record of reliable, secure delivery of electric power. However, solar storm or geomagnetic disturbance (GMD) events have demonstrated their ability to disrupt the normal operations of the power grid. The most recent example in North America occurred in March 1989, when a GMD event led to the collapse of the Hydro-Québec system, leaving more than six million people without power for nearly nine hours. Understanding the effects of GMD on bulk power systems and the ability of the industry to mitigate their effects are important to managing system reliability. For this reason, NERC formed the Geomagnetic Disturbance Task Force to assess the effects from GMD events on the bulk power system and develop industry recommendations.

This presentation will discuss the findings of NERC's Geomagnetic Disturbance Task Force on the potential impacts from GMD events, and recommendations for industry action going forward.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: **Luis Marti**, ***Ph.D, PEng.***

Position: ***Manager, Special Studies, Transmission Projects Development***

Organization: **Hydro One Networks, Inc.**
Toronto, Ontario
Canada

Nationality: ***Canadian***

E-mail: ***Luis.Marti@HydroOne.com***

Biography:

Luis Marti received MASc and PhD degrees in Electrical Engineering in 1983 and 1987, respectively, from The University of British Columbia, Canada. He has been fortunate enough to work with Professor Hermann Dommel, first as a graduate student, and to this day, as a colleague.

He joined Ontario Hydro (now Hydro One Networks) in 1989, where he is currently responsible for the Special Studies group. Current research/study activities include the development of models for the family of EMTP programs, GIC simulation, grounding, induction coordination, electromagnetic transient studies, catastrophic event investigation, EMF issues pertaining to T&D networks, and connection/operational issues around the connection of renewable generation in distribution networks.

He has participated in a number of Canadian and international technical organizations such as CSA (Canadian Standards Association), IEEE, and CIGRE.

He is also an adjunct professor at the Universities of Ryerson and Western Ontario

He is currently responsible for the Extreme Space weather preparedness project at Hydro One Networks, as well as an active participant in NERC's Geomagnetic Disturbance Task Force.

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Luis Marti***

Title of Presentation: ***Hydro One GMD Preparedness - A knowledge-based approach***

Session: ***Industries Preparedness and Protection Measurers***

Abstract:

This presentation describes the preparedness plan that Hydro One is implementing to manage the effects of Geomagnetic Disturbances for cycle 24. This effort has built on more than 25 years of in-house experience as well as cooperative efforts with the Geomagnetic Laboratory of Natural Resources Canada (NRCAN) and the University of Western Ontario.

The plan calls for an expanded GIC monitoring network, a few direct measurement of harmonics and transformer dissolved gasses, software tools to assess the distribution of GIC and its effects on major power equipment in the Hydro One 230 kV and 500 kV networks in real time, control room alarms to protect assets, and off-line analysis tools that integrate load flow analysis with GIC simulations.

All these tools and greater visibility into the effects of any given storm will converge into operating measures to protect Hydro One's assets, and ultimately in the security and reliability of supply in the Province of Ontario.

Oslo Conference 2012 Keynote Speaker Biography

Name: **Trond M. Ohnstad**

Position: ***Section Manager***

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Biography:

Trond M. Ohnstad was born in Oslo, Norway on September 15, 1958. He graduated from the Oslo College, faculty of electrical engineering, in 1981. Subsequently he has completed several special courses on power system planning, insulation co-ordination, surge protection, power electronics, and HVDC. His employment experience includes the Norwegian State Power Board, the Norwegian State Power Company and the Norwegian power grid company Statnett. His special fields of interest are insulation co-ordination and surge protection, power quality, and power system transients.

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Trond M. Ohnstad***

Title of Presentation: ***GIC experience in Norway, risk assessment and mitigation in view of existing and future transmission system***

Session: ***Expectations and Effects on Electric Power Supply and Oil and Gas Exploration Activity***

Abstract:

The Norwegian power grid covers the country from far north to far south and from west to east. The transmission system voltage levels are 420kV, 300kV and 132kV. Registration of geomagnetic induced currents (GIC) in some transformer neutrals confirms that the system is influenced by solar storms and space weather. So far the GIC has not caused any serious problems to the power system, no power outages have been caused by GIC. But the question, what will happen to the Norwegian power system if an extreme coronal mass ejection (CME) should hit the earth?, is not fully answered.

And will further development and expansion of the power grid make the situation better or worse? What kind of precautions or mitigation will be needed?

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Henrik Lundstedt**, ***Ph.D.***

Position: ***Research Scientist, Ass. Prof.***

Organization: ***Swedish Institute of Space Physics***
Scheelv. 17, 223 70, Lund, Sweden

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E-mail: ***henrik@lund.irf.se***

Biography:

Henrik Lundstedt received a Ph.D. in Astronomy at Lund University in 1984 with a focus on solar magnetic activity and its influence on Earth. He did the research for his Ph.D at Stanford University in California and has ever since collaborated with the Stanford solar group on studying WSO, SOHO and SDO data. He was leader of an international consortium for the development of a sub-arcsecond CCD video magnetograph for the Swedish Vacuum Solar Telescope on La Palma and observed early intergranular solar magnetic fields. Currently he is trying to understand solar magnetic field activity, based on SDO observations, using topological methods in collaborations with mathematicians. He is author or co-author of more than 100 research articles.

He started early to use artificial intelligence (AI) methods, such as expert systems and neural networks, in solar-terrestrial physics studies: Arranged three international workshops in Lund on the subject (AI Applications in Solar-Terrestrial Physics, 1993, 1997 and 2005). Developed the first model of the solar wind magnetosphere interaction based on neural networks. He has participated in several ESA/EU projects: ESA Space Weather Programme consortium led by Alcatel Space and was leader of the work packages on a space weather forecast prototype and space weather service. Study Manager of ESA Pilot Project on geomagnetically induced currents (in collaboration with ELFORSK). Project leader within ESA project Influences of Solar Cycles on Earth's Climate (ISAC). EU COST Action 724 Space Weather and member of the management committee, 2003-2008. EU COST Action ES0803, Developing space weather products and services, and is a member of the management committee, since 2008.

He is the project leader of the research project "Solstormar och rymdväder" granted by MSB in Sweden together with Peter Wintoft. He has participated in and contributed to numerous international panels: The NASA/NOAA Cycle 24 Prediction Panel. On "Managing Critical Disasters in the Transatlantic Domain - the Case of a Geomagnetic Storm" arranged by USA FEMA, NOAA and MSB in Sweden. He has been deputy director of International Space Environment Service (ISES) since 2002 and is heading the RWC-Sweden of ISES. He has been invited lecturer to many international research schools, such as Alpach (Austria), European Research Course on Atmospheres, France (8 times), ICTP in Italy and arranged a research summer school on La Palma, Canary Islands about the solar magnetic fields and helioseismology. He was the Swedish coordinator of International Heliophysical Year for Education/Public Outreach (E/PO, AGU), organized the ESA Sun-Earth Days in Sweden, has participated in many international interviews, given numerous public lectures, and is author of many popular articles.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Henrik Lundstedt***

Title of Presentation: ***Solar Storms and Topology: Observed with SDO***

Session: ***Stormy Sun - our Current Knowledge***

Abstract:

From discussions with representatives of the power industry we have learned that forecasts and warnings of the real strong solar storms and herewith large geomagnetic dB/dt nT/min are what would be of interest to them. The challenge for us is therefore to find the patterns when these strong solar storms occur: On long-term, topological studies of dynamo models will be described. On short-term, topological studies of real-time observations of SDO vector magnetograms will be described.

In these talk I will apply the most recent research and also show some real-world events based on observed SDO data. I will also discuss historical events in the light of the most recent and advanced solar research.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Chunming LIU**, ***Ph.D.***

Position: ***Associate Professor***

Organization: ***North China Electric Power University***
Zhuxinzhuang Dewai
Beijing 102206
China

Date of Birth: ***31.03.1972***

Nationality: ***P. R. China***

Mobile: ***+86-13811551007***

E-mail: ***liuchunming@ncepu.edu.cn***

Biography:

Chunming Liu received MSE and PhD degrees in Electrical Engineering in 2000 and 2009, respectively, from North China Electric Power University, China. His work focused on geomagnetically induced currents in the power grid, including: monitoring, modeling, and assessing the influence on security of power system.

Currently he is an Associate Professor in North China Electric Power University. He is in charge of a research project on modeling GIC in power grid supported by Nature Science Foundation of China (NSFC) and playing a big role in an international cooperation research project on GIC supported by Chinese Ministry of Science and Technology.

He received one of the Chinese Work Safety Science and Technology Progress Award in 2011, and one of the Chinese Power Science and Technology Progress Award in 2010. He won one of the Outstanding Doctoral Thesis of Beijing in 2009. He is also a Senior Engineer in Electrical Engineering since 2003.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Chunming Liu***

Title of Presentation: ***The Observations and modeling of GIC in the Chinese large-scale high-voltage power networks***

Session: ***Expectations and Effects on Electric Power Supply***

Abstract:

During geomagnetic storms, the geomagnetically induced currents (GIC) cause bias fluxes in transformers, resulting in half-cycle saturation. Severely distorted exciting currents which contain enormous amounts of harmonics threaten the safe operation of other equipment and even the whole power system. This presentation discusses the correlation between current data measured in transformer neutrals and magnetic recordings, and proves that the GIC amplitude can also be quite large even in mid-low latitude areas. Factors increasing GIC risks in China obviously include the very large scale and small resistances of the interconnected high-voltage power grid.

The fact that calculated results of GIC based on the Plane Wave Method match well with measured GIC data at the Ling'ao nuclear power plant shows that the method can be used for calculating the induced geoelectric field in mid-low latitude regions. The GIC level in Northwest 750kV Planning Power Grid under the effect of uniform electric field and strong geomagnetic storm is estimated. The result shows that during strong geomagnetic storms GICs flowing in most of transformers exceed allowable threshold value, which needs enough attention from relevant departments.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Terry Onsager**, ***Ph.D.***

Position: ***Physicist***

Organization: ***NOAA***
Space Weather Prediction Center
325 Broadway
Boulder, Colorado 80305 USA

Date of Birth: ***08.11.1956***

Nationality: ***USA***

Phone: ***+1-303-497-5713***

E-mail: ***Terry.Onsager@noaa.gov***

Biography:

Terry Onsager received a Ph. D. degree in physics in 1988 from the University of Washington, Seattle with a focus on shock waves in collisionless plasma, using Earth's bow shock as a natural laboratory. His research focused on solar wind-magnetosphere coupling and modeling the signatures of magnetic reconnection at Earth's magnetopause and in the magnetotail. This research was conducted at Los Alamos National Laboratory, the University of New Hampshire, Nagoya University, and the Institute of Space and Astronautical Science in Japan.

In 1995 he joined the National Oceanic and Atmospheric Administration's Space Weather Prediction Center. During this time his research focused on understanding the dynamics of the electron radiation belts, and he served as Responsible Scientist for the energetic particle instruments on NOAA's geostationary satellites (GOES). His recent efforts include coordinating the capabilities and priorities of international space weather organizations to improve global space weather services, and working to bridge the gap between research and operations. Most recently he was a Visiting Scientist and an advisor to the newly established Korean Space Weather Center.

Currently he is the Director of the International Space Environment Service. He serves as co-chair of the World Meteorological Organization Inter-Programme Coordination Team on Space weather, and is a member of the Space Weather Expert Team for the UN Committee on the Peaceful Use of Outer Space Working Group on the Long-Term Sustainability of Outer Space.

He has served on numerous national and international panels and committees, and has over 70 publications in refereed journals.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Terry Onsager***

Title of Presentation: ***Solar Storms and Space Weather - Opportunities for International Collaboration***

Session: ***Welcome and Opening***

Abstract:

The space weather service enterprise is growing around the globe. This growth is being driven by the increasing need to mitigate the impacts of space weather, which affect our economic and security infrastructures both in space and on the ground. Many countries are initiating new programs to deliver space weather services, while others are expanding their efforts. With this growth come both opportunities for improvement and the need for coordination. International partnerships are a critical component of all aspects of space weather, including the integrated system of space-based and ground-based observations, accurate numerical prediction models, and the delivery of comprehensive services.

The growing interest in space weather has led to the involvement of numerous international activities to increase awareness and foster cooperation. These activities are serving to prioritize and to coordinate our efforts and are helping to establish a stronger, global space weather enterprise. Among the organizations that are contributing to this global coordination are: the International Space Environment Service, the World Meteorological Organization, the United Nations Office for Outer Space Affairs, the International Civil Aviation Organization, the Coordination Group for Meteorological Satellites, and the International Committee on GNSS. In this presentation, the contributions of these various organizations to coordinating our space weather efforts and the opportunities for improvements in our capabilities will be discussed.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **David BOTELER**, ***Ph.D.***

Position: ***Research Scientist***

Organization: ***Geomagnetic Laboratory***
Natural Resources Canada
Ottawa
Canada

E-mail: *dboteler@nrcan.gc.ca*

Biography:

Dr Boteler has extensive experience in engineering and geophysics, including work on multidisciplinary projects in the Arctic and Antarctic. He spent two years running the ionospheric programme at Halley Bay, Antarctica and also initiated a study of the ionospheric conditions that caused blackout of radio communications. In the Arctic, Dr Boteler was project manager for an inter-disciplinary study of the performance of an experimental ice-breaking cargo ship, the M.V. Arctic.

Dr Boteler has over 30 years experience of research on the effects of space weather on technological systrems. He is the author of over 70 papers and reports and holds a patent for a system to prevent stray currents from causing saturation of transformers. In 1990, Dr Boteler joined the Geological Survey of Canada and has organised a number of studies of geomagnetic effects on power systems and pipelines involving industrial partners from Canada and Scandinavia. He was Director of the International Space Environment Service (ISES) from 2002 to 2012.

Dr Boteler is currently Canadian representative on the expert panel on space weather of the UN Committee on Peaceful Use of Outer Space. He is a member of the Editorial Advisory Board of "Space Weather: The International Journal of Research & Applications". He is also an Adjunct Professor in the Department of Physics & Engineering Physics at the University of Saskatchewan and a guest professor at the North China Electric Power University, Beijing. Dr Boteler is registered as a Chartered Engineer in the UK and is a Fellow of the Institution of Electrical Engineers.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***David Boteler***

Title of Presentation: ***Hazard Assessment and Real-Time Simulation of Geomagnetically Induced Currents***

Session: ***Industries Preparedness and Protection Measures***

Abstract:

Assessing the geomagnetic hazard to power systems requires knowledge of the geomagnetic activity in the area plus the conductivity structure of the earth underlying the network. These two factors can be used to calculate the electric fields experienced by a power system. The electric fields can then be used as input to a power system model to determine the geomagnetically induced currents (GIC) that will flow throughout the network. This talk will describe the calculations involved in each step of the process and how these have been integrated into a system for simulation of GIC. This can be used as an off-line tool to assess the impact of geomagnetic disturbances on power systems, for example by using archived magnetic data to run simulations of the GIC produced by past geomagnetic disturbances. The simulator can also be used in real-time, with time domain calculations of the electric field, to provide power system operators with information about the GIC in their systems.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***David Boteler***

Title of Presentation: ***An Examination of the Causes and Consequences of the March 13, 1989 Magnetic Storm***

Session: ***A Super Storm – What can happen and how to prepare for and handle it?***

Abstract:

On March 13 and 14, 1989 one of the largest magnetic storms of the 20th century caused widespread problems for power systems in North America and Scandinavia. The most significant effect was the blackout of the Hydro-Quebec power system that left 6 million people without power for over 9 hours and caused a widespread shutdown of industries. The details of the power outage and the fact that it was caused by a magnetic storm were widely reported at the time. However, there are many details of this event that have been uncovered since and have not received the same attention. This presentation will provide a detailed analysis of the March 1989 disturbance, starting with the solar eruptions that led to the disturbance and the response of the Earth's magnetosphere to the solar particles. We then describe the characteristics of the magnetic disturbance observed on the ground and how it caused problems for different power systems. A detailed analysis will be presented of the effects on the Hydro-Quebec system. We will also describe the steps that have been taken since then to mitigate the effects of magnetic storms.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **NORBERT JAKOWSKI*, Ph.D.***

Position: ***Researcher***

Organization: ***German Aerospace Center***
Kalkhorstweg 53
17235 Neustrelitz
Germany

Date of Birth: ***15.03.1948***

Nationality: ***German***

E-mail: ***Norbert.Jakowski@dlr.de***

Biography:

Norbert Jakowski received a Ph.D. degree in solid state physics in 1974 from the University of Rostock. After finishing the university he joined the Institute of Space Research in Neustrelitz, East Germany in the same year. Since German reunification in 1991 he has been working in the German Aerospace Center (DLR). Currently he heads the ionospheric research group in the Institute of Communications and Navigation of DLR.

Norbert Jakowski has long-term experience in ionospheric research, modelling and monitoring the ionosphere by using transionospheric radio sounding methods, in particular GNSS techniques. So he has developed methods for estimating and imaging the Total Electron Content (TEC) of the ionosphere from ground and space based GPS measurements by using dual frequency code and phase measurements. Comprehensive GPS data sets covering more than a solar cycle have been used to develop robust empirical models of ionospheric key parameters such as TEC, peak electron density or F2 layer height. Research studies focused on ionospheric storm mechanism and propagation of perturbations. Besides first order ionospheric range errors also higher order refraction effects on navigation signals have been studied. He has published more than 100 papers in refereed journals.

As head of the national project 'Space Weather Application Center – Ionosphere' (SWACI) he is responsible for establishing an ionospheric information and data center in DLR Neustrelitz. Due to participation in a number of projects of European Commission and ESA, he is well experienced in international collaboration. Norbert Jakowski is national representative of the European action COST ES 0803 "Developing space weather products and services in Europe", member of the steering committee of the Space Weather Working Team and the 'Network of Experts on Electromagnetic Wave Propagation' at ESA, National delegate of the World Meteorological Organization Inter-Programme Coordination Team on Space weather, and is a member of the Space Weather Expert Team for the UN Committee on the Peaceful Use of Outer Space Working Group on the Long-Term Sustainability of Outer Space.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Norbert Jakowski***

Title of Presentation: ***Space Weather Impact on Satellite Navigation and Positioning Systems***

Session: ***Effects on Satellites, Navigation and Telecommunication***

Abstract:

Space weather can adversely affect accuracy, reliability and availability of global navigation satellite systems (GNSS) in different ways. GNSS satellites can be direct subject to damage by high energetic particles or radiation. Furthermore, enhanced solar radio emission can interfere with GNSS signals and solar wind enhancements can considerably disturb the propagation of navigation signals in the ionosphere.

The presentation focuses on the discussion of ionospheric impact on GNSS which causes the biggest range errors in single frequency ranging. In dual frequency GNSS systems space weather related ionospheric perturbations must be taken into account on a broad range in magnitude at quite different scales reaching from small scale plasma turbulences in the meter domain up to large scale ionization fronts in the 1000 km range. Thus, ionospheric perturbations can considerably reduce the achievable accuracy in precise positioning applications, whereas in safety of life applications such as aircraft landing in aviation, the protection level might be violated. To be aware of the space weather impact on those applications and to enable correction or mitigation of ionospheric effects, continuous monitoring of the ionospheric behaviour is required e.g. by measuring the Total Electron Content (TEC) which is a first order measure of the ionospheric range error. Such range errors can rise up to about 100 m along low elevation radio links at GPS frequencies under high solar activity conditions. Hence, correction of ionospheric propagation errors is an important task for single frequency users and related augmentation systems such as WAAS in US and EGNOS in Europe. As for terrestrial weather there is a practical need for ionospheric forecasts. Since space weather is a natural phenomenon, basic features of the ionospheric behaviour can be forecasted when knowing the underlying physics of the coupled magnetosphere - thermosphere - ionosphere system, its current state and the driving space weather forces such as solar radiation and solar wind.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: **Richard Marshall**, ***Ph.D.***

Position: ***Physicist***

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Date of Birth: ***30.6.1964***

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E-mail: ***r.marshall@ips.gov.au***

Biography:

Richard Marshall graduated from the University of Newcastle Space Physics Group with a PhD in Physics in 1996. His research project investigated the interaction of Magneto-hydrodynamic waves in Earth's magnetosphere with the ionosphere. In 1995 he commenced work at IPS Radio and Space Services, Australia, to develop and expand Geophysical services. He has developed and implemented hardware and software systems for monitoring space weather related geomagnetic field variations and the Geophysical services derived from these systems, expanding the network of geomagnetic field monitors from a single data stream to over 25 near real-time data streams and implementing new services through collaboration with industries such as the Aeromagnetic Survey and Power industry. He has also contributed to other space weather related projects such as the real-time ionospheric model (RTIM), HF radio monitoring and Riometer projects. Over recent years he has engaged various critical infrastructure groups within Australia such as the energy, transport and communications sector groups to assist with the mitigation of space weather impacts on these industries. He is also part of the team of space weather forecasters for the Australian Space Weather Forecast Centre. IPS Radio and Space Services became the Space Weather Branch of the Australian Bureau of Meteorology in 2007.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Richard Marshall***

Title of Presentation: ***Space Weather and Critical Infrastructure in the Australian/New Zealand Region***

Session: ***Industries Preparedness and Protection Measurers***

Abstract:

The Australian region is a mid-low latitude region historically considered relatively "safe" from space weather hazards in comparison to high latitudes. Recent media focus on space weather from within the region and abroad, combined with experiences in countries at similar geomagnetic latitude ranges such as New Zealand and South Africa, have lead to an increased interest from various critical infrastructure groups within Australia regarding the possible impacts of space weather on their systems. This paper discusses the recent interactions with representatives from within the energy, transport and communications sectors such as the Australian Energy Market Operator, state power networks, gas pipeline and mining companies, major airlines, and major telecommunications service providers. The strategies being implemented at IPS Radio and Space Services to assist industry groups in mitigating space weather will be presented. This paper also discusses some results from recent space weather related studies within Australia and New Zealand.

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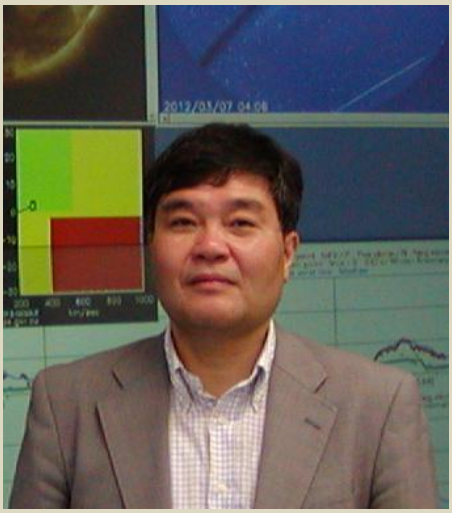
Oslo Conference 2012 Keynote Speaker Biography



Name: **Shinichi Watari**, ***Doctor of Science***

Position: ***Research Manager***

Organization: ***National Institute of Information and Communications Technology***
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Biography:

The National Institute of Information and Communications Technology (NICT) has hosted the Regional Warning Canter (RWC) of the International Space Environment Service (ISES). In 1988, NICT has started Space Weather Project. Shinichi Watari joined the Radio Research Laboratories (present NICT) in 1984 and was involved the Space Weather Project since its beginning.

He is interested in solar sources of geomagnetic disturbances and studied them using soft X-ray solar images taken by Yohkoh satellite. He found that interplanetary CMEs were sometimes observed without remarkable activities in soft X-ray solar images. Between 1994 and 1995, he worked in the NOAA/Space Environment Center (present Space Weather Prediction Center). He received a Doctor of Science in 1999 on the study of solar sources of interplanetary disturbances.

Currently he is the Research Manager of Space Weather and Environment Laboratory in the NICT. He works for not only research of space weather but also operation of Space Weather Center in Japan.

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Shinichi Watari***

Title of Presentation: ***GIC Measurement in Japan***

Session: ***Industries Preparedness and Protection Measurers***

Abstract:

It is known that geomagnetically induced currents (GIC) influence power grids. In fact several serious power black-outs as GIC effects were reported to occur in the past. Although it is believed that power grid problems from GICs hardly occur in Japan because of the country's location at geomagnetically lower latitudes. However, it is important to estimate effects of GIC through measurement in preparing for the extreme events.

Measurement of GICs was conducted at Memanbetsu, Hokkaido between 2005 and 2007 according to the close collaboration among NICT, Hokkaido Electric Power Co., and STEL, Nagoya University. In this measurement, GICs were measured associated with geomagnetic variations such as substorm-related disturbances. The measurement shows temporal variations of GICs show high correlation with geomagnetic field variations, rather than time derivatives of the geomagnetic field. This result suggests importance of underground conductivity on GIC. We will present the result of statistical study of the measurement.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Edward P. Borodzicz**, ***PhD.***

Position: ***Professor of Risk and Crisis Management***

Organization: ***Portsmouth Business School, Portsmouth University, Richmond Building, Portland Street, Portsmouth, PO1 3DE***

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Nationality: **British**

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Biography:

Edward was appointed Professor of Risk and Crisis Management at Portsmouth University in January 2005. Edward is also a visiting Professor at The Resilience Centre, Royal Military College of Science, Cranfield University, and the Cabinet office Emergency Planning College. His interests include: risk, crisis and security management, risk and human behavior, disaster response, socio-technical systems failure, corporate risk and business continuity, security and resilience, terrorism, business continuity management and ethnographic research and simulations and games for training. Edward has worked extensively over the past 17 years with the emergency services, local and central government agencies and large Businesses and Universities throughout the world.

Edward's PhD thesis was based on simulation training for complex inter-organizational response to crises among the UK emergency services. Prior to joining Portsmouth University, Edward developed and directed MSc programmes in Corporate Risk and Security Management at Southampton University, and an MSc in Risk, Crisis and Disaster Management by distance learning at Leicester University. Edward publishes in a wide range of key refereed journals, and authored a book entitled 'Risk, Crisis and Security Management' (published by John Wiley and Sons). Edward appears frequently in the media, on BBC television and Radio and also a variety of independent broadcasting networks and major daily journals. Most recently Edward Appeared in the BBC World Service programme 'World Debate' which goes out to over 90 million viewers.

More recently Edward developed an exercise, 'ARGUS', used extensively by the British security services to develop resilience among the business community in crowded and complex environments. Of key interest here is the way allowing local populations to find their own innovative solutions has contributed to better resilience and preparedness. Edward has also been involved in the production of a new PAS 200 for the British Standards Institute on Crisis Management, this was published in September 2011 and represents the first officially government sponsored standard for this in the world. Both of these pieces of work are highly innovative in suggesting that highly formalized and structured processes may actually detract from a successful outcome.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Edward P. Borodzicz***

Title of Presentation: ***Two cans of coca cola and a piece of string: developing standards for non standard events***

Session: **Society's ability to withstand short and long term shut down of Critical Infrastructure**

Abstract:

We frequently find ourselves confronted with new and more difficult to understand situations which challenge our capability to respond. Events sometimes described as 'black swans', 'disaster/catastrophe', 'low probability high impact events' or even 'acts of god' have the ability to suddenly transform the familiar and safe world we live in to a scary, and unfamiliar territory, where the normal rules of engagement no longer apply.

This presentation will look at the reasons why these types of events are more likely to occur and consider how organizations and societies can begin to develop their own resilience capability. Frequently, the solutions and strategies we currently use for a well managed society and for risk prevention are actually part of the problem in terms of a response capability for crisis events.

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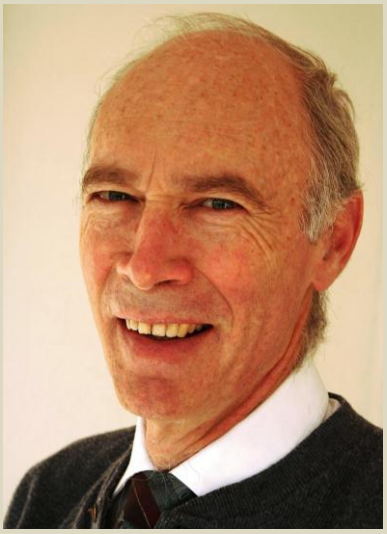

Name: **Trevor GAUNT**

Position: ***Professor, Dept. of Electrical Engineering***

Organization: ***University of Cape Town***
Rondebosch 7700
South Africa

Date of Birth: ***1948***

Nationality: ***South African***

Telephone: ***+27-21-6502810***

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Biography:

An electrical engineer with experience with an equipment manufacturer, electricity utility, consulting engineers, and in teaching and research, Trevor Gaunt specialises in power delivery system planning and design, including technology, financial analysis, and development and organisation planning. He has been responsible for electricity system development projects in many Southern and West African countries.

He is now a Professor and past head of department at the University of Cape Town. He is kept busy with undergraduate and postgraduate teaching and the financial and technical management of research projects.

His technical research interests include electrification, energy planning and network design. He presently leads a research project on the topic of geomagnetically induced currents for Eskom, the national electricity utility, with collaboration from the South African National Space Agency.

He is married to Eleanor and they have four children.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: *Trevor GAUNT*

Title of Presentation: ***Reducing uncertainty - a utility's response to severe solar storms***

Session: **Predictions of Solar Storms, Warnings, Preparedness Measures and Response**

Abstract:

Until recently, electricity utilities in mid- and low-latitude regions believed that solar storms had no (or only insignificant) effect on their power systems. Then it was noticed that the onset of damage in several large transformers, leading to their failure, correlated very closely with the Halloween storm of 2003. Only then did engineers start to understand that a very severe storm could have serious consequences outside the high-latitude regions.

There are many uncertainties in predicting the effects of solar storms on electrical systems. The severity and time of arrival of a storm are difficult to model; so are the geomagnetically induced currents (GICs) expected to flow in the power networks. Published information about the responses of different types of transformers to GICs is contradictory. Measurements of the abnormal power flows in networks during solar storms generally do not take into account the effects of the current distortion and unbalance, potentially giving misleading signals to the operators. And the normal requirement for optimum system management while allowing for the possibility of faults caused by lightning, birds and other causes all limit the capacity of system operators to respond to the threats of GICs.

A utility's response to the threat of damage by GICs depends on the expected frequency and magnitude of solar storms. Approaches adopted in high-latitude regions might not be appropriate where fewer storms are expected to reach damaging levels. The risks of an extreme storm cannot be ignored, and understanding the response mechanisms suitable for low-latitude regions has the capacity to inform power systems planners and operators worldwide.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Knut Stanley Jacobsen*, Ph.D.***

Position: ***Senior Engineer / Research Geodesist***

Organization: ***Norwegian Mapping Authority***
Kartverksveien 21
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Norway

Date of Birth: ***02.07.1981***

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Biography:

Knut Stanley Jacobsen received a Ph. D degree in 2010 from the Department of Physics, University of Oslo, with the thesis "Cluster and THEMIS studies of dayside magnetospheric boundary layer phenomena". The work focused on the interaction of charged particles and electric and magnetic fields in the boundary layers between the solar wind and the magnetosphere of the Earth. During his stay at the university, he was one of the main developers of a Langmuir probe scientific instrument for sounding rockets and satellites. He is an author of 8 papers in refereed scientific journals.

In 2010 he started working at the Norwegian Mapping Authority (NMA), and since then he has been involved in several space weather related projects, including developing systems for monitoring of the ionosphere. He is currently heading the effort at NMA to develop a publicly available real-time ionosphere monitoring service for the Norwegian region.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Knut Stanley Jacobsen***

Title of Presentation: ***Impact of a geomagnetic storm on the GNSS-based positioning service CPOS***

Session: ***Effects on Satellites, Navigation and Telecommunication***

Abstract:

At high latitudes, above 60 degrees North, in the vicinity of the auroral oval, the ionosphere frequently experiences disturbed conditions that impact GNSS-based services.
The Norwegian Mapping Authority (NMA) is operating a national real-time kinematic (RTK) positioning network and an ionosphere monitoring software.

We present the ionospheric observations during a geomagnetic storm, and the observed consequences for the positioning service.
Significant disruptions that can be clearly related to the ionospheric disturbances were observed. They tend to occur in roughly longitudinal bands, which are expected for disturbances caused by the particle and energy precipitation in the auroral oval.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Inge Edvardsen**, ***Ph.D. student.***

Position: ***Survey Management Engineer***

Organization: ***Baker Hughes Norge AS***
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Norway

Date of Birth: ***20.03.1975***

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Biography:

Inge Edvardsen graduated as Sivilingeniør at the Norwegian University of Science and Technology (NTNU) in 1999. The program was completed at the faculty of Civil and Environmental Engineering. The master's level thesis was in Geodesy and was entitled: Estimation of Uncertainty in Wellbore Positioning".

In 2000 he started working for Acergy S.A, as an online Surveyor. Acergy is an international offshore seabed to surface engineering and Construction Company. The daily tasks varied from pipeline inspections to installation of seabed arrangements.

Inge joined Baker Hughes in 2002 to work within the Survey Management department. Baker Hughes is a large global oilfield services company and provides the world's oil & gas industry with products and services for drilling, formation evaluation, completion, production and reservoir consulting. His current position is Senior Engineer and he has got particular customer responsibilities towards ENI. In the later years he has been special interested in the external magnetic field and its effect on directional drilling.

He has a membership in SPE (Society of Petroleum Engineers) and was co-author on SPE 87169 "Drilling Fluid Affect MWD Magnetic Azimuthal and Wellbore Position", presented at the IADC/SPE Drilling Conference – Dallas, Texas, 2004.

In 2011 he started a four years industrial PhD program, a co-operation between The University of Tromsø, The Research Council of Norway and Baker Hughes Norge. The title of the thesis is: Effects of geomagnetic disturbances on offshore wellbore positioning.

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Inge Edvardsen***

Title of Presentation: ***How to Deal with Geomagnetic Storms in Directional Drilling***

Session: ***Expectations and Effects on Electric Power Supply and Oil and Gas Exploration Activity***

Abstract:

The oil and gas industry are making extensive use of wells with large horizontal range, so far the record is 12 km.

The directional drilling technique demands directional references to determine the trajectory of the wells. Gravity is the obvious mean for vertical reference. In the horizontal plane the Earth magnetic field and Earth's rotation by north-seeking gyro are at hand, and both are in use. However, of economic and technical grounds, navigation by Earth's magnetic field has become the more used of the two.

Unfortunately, Earth's magnetic field is subject to disturbances – magnetic storms – with origin in solar activity. At most of the Earth is a minor problem, at high magnetic latitude the situation is different. By monitoring magnetic storms the uncertainties in the wellbore positions are diminished, unnecessary pull-outs of the drill string reduced and the risk of collision with nearby wells reduced. This benefits economy, reservoir exploitation and security.

Along the coast of Norway a series of magnetometers has been installed for monitoring magnetic disturbances for the oils industry as well as for scientific ends. Through a decade of cooperation between the University of Tromsø and the industry an operational monitoring and correction system has been established, and a wealth of experiences collected.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Anna Belehaki**, ***Ph.D.***

Position: ***Research Director*** *and* ***Head of the Ionospheric Group***

Organization: ***National observatory of Athens (NOA), Greece***

Date of Birth: ***1965***

Nationality: ***Greek***

Mobile: ***+30 6974334526***

E-mail: ***belehaki@noa.gr***

Biography:

Anna Belehaki received a Ph.D. on Space Physics in 1992 from the National and Kapodistrian University of Athens and immediately after, she joined Prof. Gordon Rostoker's group in the Canadian Network for Space Research of the University of Alberta in Canada as post doctoral fellow. In 1995 she was elected in a research position in the National Observatory of Athens and since 2007 she is research director and head of the Ionospheric Group.

Anna Belehaki has a long term experience on ionospheric experiments and monitoring techniques, on space weather prediction and forecast models for ionospheric effects, on the development of operational space weather services and on the study of solar wind-magnetospheric-ionospheric interactions for the modeling of the topside ionosphere and the plasmasphere. Anna Belehaki is the PI of the Athens Digisonde project, coordinator of the DIAS project (the European Digital Upper Atmosphere Server, funded by the EC, eContent Programme) and scientific manager of the ESPAS project (Near-Earth Space Data Infrastructure of e-Science, funded by the EC, FP7-eInfrastructures). She is the chair of the Management Committee of the COST Action ES0803 "Developing Space Weather Products and Services in Europe", a network among 26 countries where 85 experts from all over the world participate. From 2009 to 2012 she is co-chairing the European Space Weather Weeks.

She has published more than 70 papers in peer review international scientific journals and participated to more than 120 scientific conferences. In 2010 together with the core group of COST Action ES0803 she established the Journal for Space Weather and Space Climate – SWSC, for which she is serving as Editor in Chief.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Anna Belehaki***

Title of Presentation: ***The European Space Weather COST Action ES0803***

Session: ***Welcome and Opening***

Abstract:

COST Action ES0803 "Developing Space Weather Products and Services in Europe" is primarily aimed at forming an interdisciplinary network between European scientists dealing with different issues relevant to Geospace as well as warning system developers and operators in order to assess existing space weather products and recommend new ones.

This talk summarizes the final achievements after four years of successful implementation, such as advances in modeling and predicting space weather, validation and demonstration of selected key models, recommendations for new space weather products and services, dissemination, training and outreach activities.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Anna Belehaki***

Title of Presentation: ***Space Weather Effects on Communications***

Session: ***Effects on Satellites, Navigation and Telecommunication***

Abstract:

Knowledge of the state of the upper atmosphere, and in particular its ionized part, is very important in several applications affected by space weather, especially the communications and navigation systems that rely on radio transmission. To better classify the ionosphere and forecast its disturbances over Europe, a data and model infrastructure platform called the European Digital Upper Atmosphere Server (DIAS) has been established in the National Observatory of Athens by a European consortium formed around eight ionospheric stations, and funded by the European Commission.

The DIAS system (http://dias.iono.noa.gr) operates since 2006 and the basic products that are delivered are real-time and historical ionograms from all DIAS ionospheric stations, frequency plots and maps of the ionosphere over Europe based on the foF2, M(3000)F2, MUF and electron density parameters, as well as long term and short term forecasting up to 24 hour ahead. The DIAS system supports more than 400 subscribed users from all over the world, including NOAA and ESA (SWENET).

The system is currently under major upgrade in the frames of the ESPAS EU-FP7 project. It will make available also maps of the electron density at user-defined heights up to GNSS orbits, and TEC and partial TEC maps over Europe updated in real-time.

The talk summarizes the models based on which the DIAS products are generated as well as the various services offered by the system to support HF users, satellite operators, space agencies, research organizations and the space weather scientific community.

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Oslo Conference 2012 Keynote Speaker Biography

Name: **Leif Svalgaard**, ***Ph.D.***

Position: ***Research Physicist***

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Date of Birth: ***1942***

Nationality: ***Danish***

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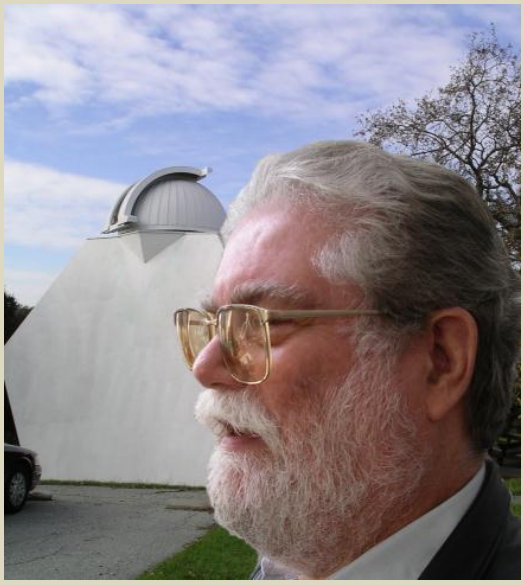

Biography:

While completing studies [Geophysics] at the University of Copenhagen, Leif Svalgaard [after a stint as geomagnetic observer in Greenland] discovered the influence of the interplanetary magnetic field polarity on the geomagnetic field in the polar regions [the Svalgaard-Mansurov effect] providing convincing evidence that the Earth's magnetosphere was permanently 'open' to the solar wind. With colleagues at the Danish Computer Company A/S Regnecentralen he co-developed for the RC4000 medium-sized computer its highly influential computer operating system, introducing many of the concepts underlying modern operating systems. In 1972 he was invited to join the Institute for Plasma Physics at Stanford University as a Senior Research Physicist. At Stanford he helped construct the Wilcox Solar Observatory to measure the sun's large-scale magnetic field. These measurements continue to the present day [and hopefully beyond] and form the basis for the successful prediction of solar activity cycles from cycle 21 through to the present cycle 24, using the solar polar magnetic field at solar minimum as an indicator of the strength of the next cycle through its use as a 'seed' for the solar cycle dynamo. Svalgaard was a member of the NOAA/NASA expert panel for prediction of cycle 24 and with colleagues in 2004 predicted that cycle 24 would be the smallest in the past 100 years. The study of the large-scale solar field and its sector structure led Svalgaard to co-discover the shape of the Heliospheric Current Sheet and its importance for modulation of galactic cosmic rays. While at Stanford he served as US Special Envoy to the Soviet Union for Protection of the Environment. During 1980-2000 Svalgaard was in private industry, including serving as consultant to SHAPE (den Haag, the Netherlands) on communications systems for the Alternate War Headquarters for Allied Forces Europe. Svalgaard returned to space physics in 2002 developing new geomagnetic indices allowing determination of solar wind magnetic field strength and solar wind speed back to the 1830s, establishing a firm climatology for space weather. In 2004 he was visiting professor at the Solar Terrestrial Environment Laboratory at the University of Nagoya, Toyokawa, Aichi, Japan. In 2009 Svalgaard returned to Stanford University. His latest research is on reconstruction of the historical sunspot number series, showing among other things that there very likely was no Grand Solar Maximum during the 20th century. He is team leader of an International Teams in Space Science [ISSI] workshop on 'Long-term reconstruction of Solar and Solar Wind Parameters' and he is a member of the Organizing Committee of the International Astronomical Union Working Group 'Coordination of Synoptic Observations of the Sun'.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Leif Svalgaard***

Title of Presentation: ***Solar Activity – Past, Present, and Future***

Session: ***Stormy Sun - our Current Knowledge***

Abstract:

As our civilization depends increasingly on space-borne assets and on a delicate and vulnerable earth-bound infrastructure, *solar activity* and its potential impact becomes of increasing importance and relevance. In his famous paper on the Maunder Minimum, Eddy (1976) conclusively demonstrated that the Sun is a variable star on long time scales. After the recent decade of vigorous research based on cosmic ray and sunspot data as well as on geomagnetic activity, an emerging consensus reconstruction of solar wind magnetic field strength has been forged for the last century. This is a significant development because, individually, each method has uncertainties introduced by instrument calibration drifts, limited numbers of observatories, and the strength of the correlations employed. The consensus reconstruction shows reasonable agreement among the various reconstructions of solar wind magnetic field the past ~170 years. New magnetic indices open further possibilities for the exploitation of historic data. Reassessment of the sunspot series (no Modern Grand Maximum) and new reconstructions of Total Solar Irradiance also contribute to our improved knowledge (or at least best guess) of the environment of the Earth System, with obvious implications for management of space-based technological assets or even climate. Several lines of evidence suggest that the Sun is entering a period of low activity, perhaps even a Grand Minimum. Average space weather might be ''milder'' with decreased solar activity, but the extreme events that dominate technological effects are not expected to disappear; they may even become more common.

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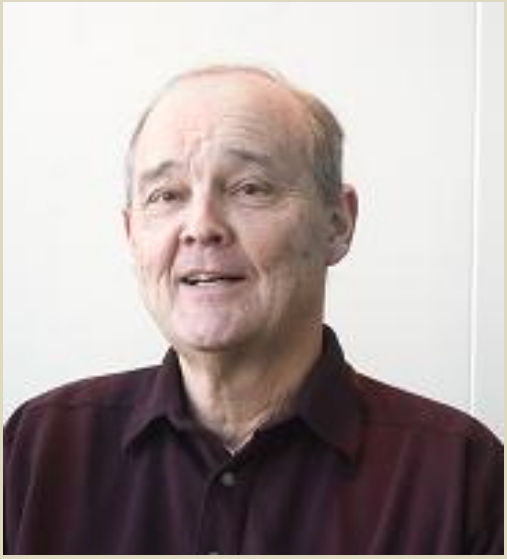

Name: **Bengt Sundelius**

Position: ***Professor of Government, Uppsala University & Strategic Advisor to the Director General of MSB***

Organization: ***Swedish Civil Contingencies Agency, Kungsgatan 37 Stockholm, SWEDEN***

Date of Birth: ***1950***

Nationality: ***Sweden***

E-mail: ***bengt.sundelius@msb.se***

Biography:

Bengt Sundelius is Professor of Government, Uppsala University, and Strategic Advisor to the Director General of the Swedish Civil Contingencies Agency. He has been Chief Scientist of the Swedish Emergency Management Agency, Head of the Department of Security and Strategy of the Swedish National Defence College, founding Director of the National Centre for Crisis Management Research & Training and Director of Research for Strategy & Security Policy at the Swedish National Defence Research Establishment.

Sundelius has served as expert on the EU Commission based European Security Research Advisory Board (ESRAB) and on the European Security Research and Innovation Forum (ESRIF) that formulated the EU FP7 agenda for European security research. He now serves on the Security Research Advisory Group giving guidance to the EU Commission in this area. He is Agreement Director for the Science & Technology Agreement between the Swedish government and the US Department of Homeland Security that was concluded in 2007.

Sundelius has extensive experience in training high level public officials in crisis management and decision-making under pressure. He has contributed to various government commissions in the area of civil protection, societal security and defence policy.

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Oslo Conference 2012 Keynote Speaker Presentation

Speaker: ***Bengt Sundelius***

Title of Presentation: ***Building Capacity for Preparedness***

Session: ***Authorities Handling Strategies and Contentious Level***

Abstract:

To meet in effective ways the extreme space weather challenge requires public authorities and businesses to invest well in advance in various preparedness efforts. The key tasks for such capacity building will be presented as well as some of the obstacles to achieving effective capacity for warning-preparedness-response-recovery. A way forward to strengthen international collaboration among different stake-holders will be suggested.

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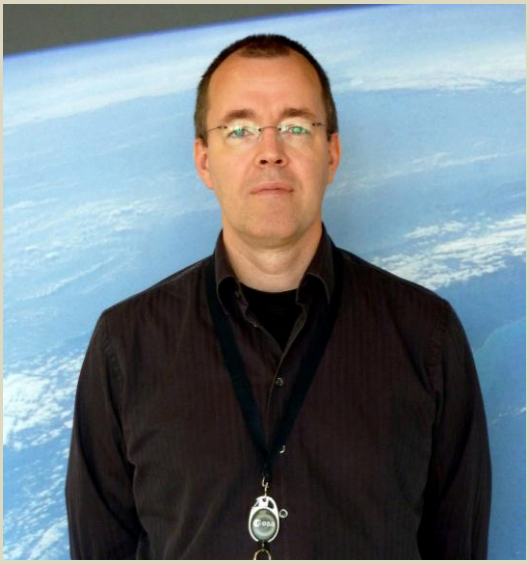

Name: **Juha-Pekka Luntama**

Position: *Space Weather Manager*
ESA SSA Programme

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Biography:

Juha-Pekka Luntama was born in Perniö, Finland in 1964. He studied spaceflight instrumentation and microwave remote sensing in Helsinki University of Technology (recently renamed as Aalto University). He graduated as M.Sc. in EE and Lic.Sc (Tech.) in 1991 and 1997. He left the University in 1997 to work as EUMETSAT Research Fellow in the Met. Office in the UK focusing on developing radio occultation measurement technique for atmospheric sounding.

Juha-Pekka Luntama is the manager of the Space Weather (SWE) Segment in the Space Situation Awareness (SSA) Preparatory Programme in ESA. He is leading an Agency wide team establishing space weather services in the framework of the SSA programme. The approach adopted by ESA is to develop the services by utilising the European expertise and assets in the space weather domain under the coordination of ESA. Thus, Juha-Pekka Luntama is managing the industrial contracts and studies related to the establishment and development of the services. He is also the point of contact in ESA for the SWE services related international collaboration activities.

Before joining ESA in 2009, he was working in the Finnish Meteorological Institute (FMI) leading the research on GNSS based ionospheric monitoring and error mitigation techniques. His main area of interest was high resolution ionospheric imaging by tomography. Before that he worked for many years in the European meteorological satellite organisation EUMETSAT in Darmstadt, Germany. In EUMETSAT he was leading the development of the Radio Occultation observation system GRAS (GNSS Receiver for Atmospheric Sounding) for the EPS (EUMETSAT Polar System) mission.

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Keynote Speaker: ***Juha-Pekka Luntama***

Title of Presentation: ***European Space Weather Activities within ESA***

Session: ***Introduction to Space Weather***

Abstract:

ESA has been actively working on space weather projects for over 15 years:
• 1998: ESA Workshop of Space Weather
• 2004: First European Space Weather Week
• 2003 - 2005: Space Weather Applications Pilot

Project
• 2009: SSA Preparatory Programme
• 2012: 9th European Space Weather Week
• Space weather activities are carried out within several programmes:
• SSA (Space Situational Awareness)
• GSTP (General Support Technology Programme)
• GSP (General Studies Programme)
• TRP (Technology Research Programme)

- Development of the SSA-SWE services is based on utilization of European space weather assets and expertise
- ESA is coordinating the system development and establishing a framework to network European assets
- Services will be provided by European centres forming Expert Service Centres (ESCs) Federated SSA-SWE Services

• ESA will establish agreements with
- ESCs for service provision
- Asset owners (ground based and space borne assets) for access to the SWE data

• ESA will continue the development of the SSA-SWE space segment to ensure availability of the space weather data

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Juha-Pekka Luntama***

Title of Presentation: ***Effects of a Super Storm on Vital Satellite Systems, and other Critical Infrastructure - How do we maintain Public Awareness and Improve our Protection?***

Session: ***Future Developments and Expectations***

Abstract:

Today our everyday activities are depending on the space borne infrastructure more than ever before in the history of the mankind. Actually, we do not often recognize this dependence as we take the services and the systems we are using as granted. Many of these services ranging from international television broadcasts to banking services, accurate weather forecasts and navigation with our mobile phones are critically depending on the space infrastructure that we have developed over the last four decades. Our dependency on the space borne systems becomes evident only if an external event suddenly disturbs our access to these systems for a substantial period of time.

Space Weather impacts on the spacecraft are a well-known issue and the space environment is taken carefully into account in the satellite design and testing. The known space weather related hazards for satellite systems include Electro Static Discharge (ESD) in the satellite structure, energetic particle damage to the solar cells and satellite electronics, Single Event Upsets (SEU), particle impacts on CCDs, etc. However, it is very difficult and very expensive to build a completely foolproof technical system. The failure of a system is a question of probabilities. In the case of extreme space weather events, the probability of a spacecraft failure increases substantially over the "nominal" space environment scenarios. From the user perspective it is also important to notice that even if the satellite systems themselves are not harmed, space weather can limit or prevent access to these systems due to ionospheric disturbances or GIC induced damage in the ground systems. In this presentation I will consider the potential impacts of extreme space weather events on satellite systems and the means of mitigating these impacts. I will also discuss the some of the possible impacts on the services depending on the satellite systems and present samples of the impacts from smaller space weather events over the last decades.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Rainer Schwenn, Ph.D.*

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E-mail: *rschwenn@gmx.de*

Biography:

Prof. Dr. Rainer Schwenn obtained his doctorate in Munich (Germany) at the Institut für Plasmaphysik in Garching in 1969. Then, he worked at the MPI für Extraterrestrische Physik in Garching as CoI and manager of the plasma instruments for the Helios solar probes. From 1978 until his retirement in 2006 he worked at the MPI für Sonnensystemforschung in Lindau.

His scientific work concentrated on solar wind, coronal transients and space weather phenomena. As CoI and project scientist of the Large Angle and Spectrometric Coronagraph (LASCO) on SOHO he and his team developed a new type of coronagraph. Since 1996, he acted as Initiator and Co-Investigator of the German-Argentinean Solar Observatory in El Leoncito, in particular of the Mirror Coronagraph for Argentina (MICA).

He was appointed „Außerplanmäßiger Professor“of Astronomy and Astrophysics at the Universität Göttingen in 1998 and gave many lectures on Physics of the Heliosphere. As guest lecturer he visited various institutions and universities all over the world, e.g. in Buenos Aires, San Juan (Argentina), Concepcion (Chile), Sao Paulo, San Jose dos Campos (Brazil), UNAM (Mexico), Beijing. He served in several Peer Review Panels for ESA and NASA and for a 3-year term in the Solar System Working Group of ESA.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Rainer Schwenn***

Title of Presentation: ***Coronal Mass Ejections – the Drivers of Space Weather***

Session: ***Stormy Sun - our Current Knowledge***

Abstract:

The space weather story began in 1859 with Carrington's famous observation of a strong solar flare which he correctly associated with the dramatic geomagnetic storm on Earth, just 17 hours later. However, it took more than 100 years, until the real culprits for space weather effects were revealed: coronal mass ejections (CMEs). These are huge plasma clouds of enormous dimensions that are ejected by the Sun at speeds of several hundreds of km/s. They were made visible by coronagraphs on board Earth-orbiting satellites, beginning in the Skylab era in 1973. CMEs expand into interplanetary space and drive shock waves in front of them that literally shake major parts of the heliosphere, including the planets' magnetospheres. CMEs often occur in close association with flares, it is true, but not necessarily.

Since their discovery, several thousands of CMEs were registered and analyzed, and their relations with space weather effects were investigated. However, to this day, major questions remain still unanswered, e.g.:

1. What are the indicators of an upcoming CME, with respect to time, location, and importance?
2. How are CMEs as seen by coronagraphs transformed into their interplanetary counterparts (ICMEs) as we encounter them in situ, e.g. near the Earth?
3. How can ICME propagation be determined such that their impact on Earth can be forecasted more precisely?

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *David BERGHMANS, Ph.D.*

Position: *Operational Director a.i. "Solar Physics and Space Weather"*

Organization: *Royal Observatory of Belgium*
Ringlaan -3- Av. Circulaire
1180 Brussels, Belgium

Date of Birth: *2012-03-08*

Nationality: *Belgian*

Office tel: *+32-2-790 3 949*

E-mail: *david.Berghmans@sidc.be*

Biography:

David Berghmans received a PhD in sciences in 1997 from the KU Leuven University in Belgium with a theoretical thesis in solar physics on the generation of MHD waves in coronal loops. He moved in 1997 to the Royal Observatory of Belgium (ROB, Brussels) to work as a post-doc on coronal EUV images of the EIT telescope onboard the ESA/NASA mission *Solar and Heliospheric Observatory.*

In 2000, he was one of the main persons behind the kick-off of space weather services at ROB. Since then, ROB has grown to be a cornerstone of European space weather research and operations. Currently, ROB is a partner in variety of Space Situational Awareness activities (European Space Agency), it operates the World Data Center for the Sunspot Index, and produces space weather forecasts and monitoring reports on a 24h/7d basis. Together with its neighboring sister institutes, the ROB constitutes the "Solar Terrestrial Center of Excellence". In 2002, Dr. Berghmans took-up a 1 year research fellowship at ESTEC. During this year he developed image-processing software to automatically extract coronal mass ejections from coronagraphic data, now in daily use for space weather monitoring. After that, D. Berghmans returned to ROB and became Principal Investigator of the SWAP instrument, an innovative, small EUV imager for space weather monitoring onboard PROBA2. In that context, he is responsible for the Science Operations Center of PROBA2 ("PROBA2 Science Center") hosted at ROB. The current activities of D. Berghmans include the management of the "Solar Physics and Space Weather" research group at ROB of about 40 researchers and support staff (also known as 'SIDC', http://sidc.be/). Besides this, D. Berghmans is co-PI in the EUI consortium that is preparing for the EUV imagers onboard the Solar Orbiter mission. Scientifically, D. Berghmans is (co)-author of more than 44 refereed papers on solar physics and space weather, with a total citation count exceeding 1000.

Oslo Conference 2012 Keynote Speaker Presentation

Presenter: ***David Berghmans***
Co-authors: ***Eva Robbrecht, Ronald Van der Linden***

Title: ***The SIDC, a European Space Weather Prediction Center***

Session: ***Predictions of Solar Storms, Warnings, Preparedness Measures and Response***

Abstract:

The International Space Environment Service (ISES) consists of a worldwide network of so-called Regional Warning Centers (RWC). In the European Union, RWCs exists in Lund, Warsaw, Prague and Brussels. Here we concentrate on the activities of the RWC in Brussels, also known as the SIDC (Solar Influences Data analysis Center, http://sidc.be), hosted at the Royal Observatory of Belgium since January 2000.

We will give an overview of the present space weather services offered by the SIDC. These services take the form of email messages send to registered users. Covering the longest timescales, a monthly bulletin is distributed with an update of the international sunspot number as well as two mid-term predictions of the progress of the solar cycle. On a weekly timescale, a review bulletin is distributed that covers the past week's geomagnetic and solar activity. On a daily basis, so-called URSIGRAMs are produced that give an update and forecast of a few key space weather indices. On the shortest timescale, fast alert messages are send out whenever automated software identifies major flares or coronal mass ejections. Human edited fast alert message ('PRESTO') are often followed soon after to clarify the interpretation.

We will illustrate the above services by looking back at a recent space weather event and illustrate it with SIDC messages produced at that time. Special attention will be given to the SIDC-operated space weather instrumentation on the ground (white-light, H-alpha, radio) and in space (PROBA2: EUV imaging and UV radiometry).

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Richard Horne, Ph.D.*

Position: *Individual Merit Scientist*

Organization: *British Antarctic Survey*
Madingley Road
Cambridge CB3 0ET
UK

Date of Birth: *1955*

Nationality: *British*

Telephone: *+44-1223-221542*

E-mail: *R.Horne@bas.ac.uk*

Biography:

Professor Richard B. Horne is an Individual Merit scientist at the British Antarctic Survey and Honary Professor at the University of Sheffield. He has a B.Sc. in Physics, a Doctorate in Space Plasma Physics, and over 33 years research experience. He currently leads a European Framework 7 project called SPACECAST, to help protect satellites from space weather by developing European modeling and forecasting capabilities.

Richard has a special interest in particle acceleration, planetary radiation belts, and Space Weather. In 2005 he won achievement awards from both NASA and ESA for his research. Richard has also worked on hazard risk to satellites for four leading London Insurance companies and on a Space Weather Programme Study for the European Space Agency led by Alcatel Space (Paris). He has provided scientific advice on Space Weather to UK government, for a Prime Ministerial briefing and for UK House of Commons Select Committees on Science and Technology and on Defense.

Richard has published more than 140 research papers, including 3 in *Nature* and 2 in *Nature Physics*. He has numerous international collaborations, serves on UK advisory committees for satellite missions, and NASA funding panels. He is Co-Investigator on the ESA CLUSTER and NASA RBSP satellite missions, a former Commission Chair of the International Union of Radio Science (URSI) and a former Vice President of the Royal Astronomical Society. He is a Fellow of the Royal Astronomical Society and a Fellow of the American Geophysical Union.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Richard B Horne***

Title of Presentation: ***Forecasting the Radiation Belts with SPACECAST to Help Protect Satellites on Orbit***

Session: ***Predictions of Solar Storms, Warnings, Preparedness Measures and Response***

Abstract:

With more than 800 satellites on orbit we rely more than ever on satellites for services such as navigation and positioning, internet, TV, banking, security and much more. All these satellites are at risk from large space weather events where the radiation hazard can increase substantially causing damage to electronic components and loss of power. For example, during the so-called Halloween storm of 2003 47 satellites reported anomalies and one scientific satellite was a total loss. More generally, it has been estimated that if a super-storm of the size of the 1859 Carrington storm occurred again the cost in terms of satellites and satellite services could be as high as $30 billion.

In this talk we will describe a new European FP7 project called SPACECAST (www.fp7-spacecast.eu) which is designed to help protect satellites on orbit from high energy particle radiation. The project is focussed on geostationary orbit, where most telecommunications satellites are located and medium earth orbit where the GPS, GNSS and the new Galileo radio-navigation satellites orbit the Earth. We will describe a new European system which forecasts the radiation belts up to 3 hours ahead, and which provides a risk index so that satellite operators can take action to mitigate effects. We will also discuss the difficulties of forecasting up to 1 day ahead, and the areas where more research is needed to improve the forecasts.

Oslo Conference 2012 Keynote Speaker Biography

Name: *Andrew RICHARDS, Ph.D.*

Position: *Severe Risk Analyst*

Organization: *National Grid UK*

Date of Birth: *12/04.1961*

Nationality: *British*

Mobile: *+44-7703025336*

E-mail: *andrew.richards@nationalgrid.com*

Biography:

Andrew Richards received a Masters degree in Mathematics from Cambridge University in 1985 and for many years worked as a mathematics teacher in high schools. In 2005 he returned to higher education and received a Ph.D. in Probability from Heriot-Watt university, working in extreme event analysis.

In 2009 he joined National Grid, the UK's electricity transmission operator, as an analyst in Energy Forecasting. Part of this role involved the monitoring of Space Weather for the protection of the electricity transmission system.

In 2010 he became part of a team planning upgrades to National Grid's policies on Space Weather, working closely with Government Departments, particularly the Department of Energy and Climate Change, and the Cabinet Office. In 2011 the post of Severe Event Analyst was created, and he moved into this role fulltime.

He has delivered talks on Space Weather and its effects on Electricity Power Grids in many places, including Helsinki, Namur during European Space Agency Space Weather Week, Manchester University, Cambridge University and London. He has given interviews on radio and television on the effect of Space Weather on ground based infrastructure, including the BBC's flagship science programme Horizon. He has recently been working on modeling the impact of geomagnetically induced currents on all transformers on the GB high voltage network.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Andrew Richards***

Title of Presentation: ***The GB Electricity Transmission Network: Modeling, Monitoring and Mitigation***

Session: ***Expectations and Effects on Electric Power Supply and Oil and Gas Exploration Activity***

Abstract:

National Grid is the Electricity System Operator for mainland Britain. Although GB has experienced no system disturbances since 1991, the potential for serious disruption and damage to the network from a very large solar event is a significant risk.

This presentation focuses on the modeling that National Grid has undertaken to understand the effects of an extreme storm on the network. This involves modeling of the magnetic field variations, the geological structure, the geomagnetically induced currents in the high voltage network, and the effects on both super-grid transformers and generator step-up transformers. The mitigating actions that would be put into place in the event of such a storm will also be discussed.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: ***Edward W. Cliver***

Position: ***Space Scientist***

Organization: ***Space Vehicles Directorate***
Air Force Research Laboratory
(AFRL)
Sunspot, New Mexico 88349
USA

Date of Birth: ***1948***

Nationality: ***USA***

E-mail: ***ecliver@nso.edu***

Biography:

Ed Cliver received a D.Sc. from Nagoya University in 2000 for a thesis on the semiannual variation of geomagnetic activity with Prof. Y Kamide as thesis advisor. He has worked in space physics for AFRL since 1979. His research interests include: solar eruptions, solar energetic particles, geomagnetic activity, cosmic ray modulation, long-term variation of solar and solar wind activity, and the history of solar-terrestrial physics.

Recently he has been working with Frédéric Clette (Royal Observatory of Belgium) and Leif Svalgaard (Stanford University) and others in a community-wide effort to reconcile the differences between the international and group sunspot numbers.

He has served as a member of the Editorial Board of Solar Physics since 1998 and is the author/ co-author of over 100 papers in refereed journals.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Edward W. Cliver***

Title of Presentation: ***A Super Storm - Current Limits of Extreme Space Weather***

Session: ***A Super Storm - What can happen and how to prepare for and handle it?***

Abstract:

On the afternoon of 1 September 1859, shortly after finishing his drawing of a large sunspot group that was located near the center of the Sun's disk, Richard Carrington found himself, as he put it, "an unprepared witness of a very different affair." He had become the first observer of a solar flare. Remarkably, the flare Carrington observed was associated with what remains, after 150 years, arguably the largest solar-terrestrial event ever recorded. The 1859 space weather event is at or near the top of lists of flare size, solar wind speed, geomagnetic storm intensity, and auroral extent. Recent work by Clark et al. indicates that the first recorded flare remains the largest yet observed with a soft X-ray classification of ~X40 in comparison with ~X30 for the largest flare observed during the space age. Until earlier this year, it was also thought that the 1859 flare was associated with the largest solar energetic proton (SEP) event of the last 150 years – but recently Wolff et al. demonstrated that the nitrate record in ice cores is not a reliable measure of solar protons. In another development, it is becoming increasingly clear that the -1760 nT minimum Dst value reported for the September 1859 storm is over-stated by about a factor of two. In addition to updating the benchmarks for extreme space weather, I will examine the aspects of geomagnetic storms and space radiation events that have the greatest impact on technology, specifically magnetic field changes associated with mid-latitude aurora and SEP events that peak at Earth near the arrival of interplanetary shocks driven by flare-associated coronal mass ejections.

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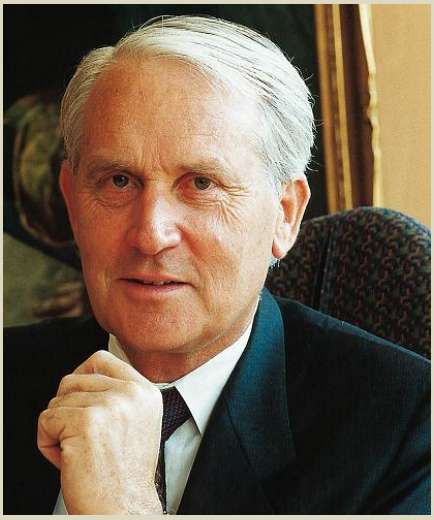
Oslo Conference 2012 Keynote Speaker Biography



Name: *Sven Bang ULLRING*

Position: *Former President and CEO of Det norske Veritas (DNV) and Chairman of Governmental Commission on Critical Infrastructure Protection*

Date of Birth: *16th December 1935*

Nationality: *Norwegian*

E-mail: *Sven.Ullring@dnv.com*

Biography:

Sven Bang Ullring received his Masters degree in Civil Engineering (Dipl.ing. Bau) from ETH in Zurich in 1960 and started his career in Design Office in Malmø in Sweden working with design of bridges, marine structures and industrial and office buildings. In the period 1963-66 he worked in Sri Lanka as Project Engineer for Hydro Electric Scheme Stage II and as Project Manager for Ceylon Steel Mill. In the period 1966-72 he was Contracts Manager for projects in South East Asia, Middle East, Africa and South America. In the period 1962-81 he was employed by Skanska AB working with building hospitals, schools, airports, ports and bridges, hydroelectric and irrigation schemes, grain silos, industrial and residential complexes, mostly turnkey projects in Abu Dhabi, Bangladesh/East Pakistan, Ethiopia, Iraq, Kenya, Kuwait, Libya, Oman, Peru, Poland, Saudi Arabia, Sri Lanka, Tanzania and USA.
In the period 1972-81 he was Director of the International Department and based in Saudi Arabia in the period 1977-1980.

In the period 1981-85 he was President and CEO of Norconsult AS, Oslo, Norway, and in the period 1985 – 2000 he was President and Chairman of the Executive Board of Det Norske Veritas (DNV).

He was Chairman of the Royal Commission for Safeguarding Norway's Critical Infrastructure in the period 2004 – 2006.

His present positions are Chairman of the board of The Fridtjof Nansen Institute in Oslo and Chairman of Keppel Corporation in Singapore and a member of their Technology Advisory Panel.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Sven Bang Ullring***

Title of Presentation: ***Critical Infrastructure Protection – Are we willing to try a Disaster?***

Session: ***Society's Ability to Withstand Short and Long Term Shut Down of Critical Infrastructure***

Abstract:

A precondition for the development of the modern welfare society after the Second World War was the increased development in infrastructures and societal functions. As a result of this, society became increasingly dependent on the various infrastructures and societal functions. Security measures were based on the threat from the Cold War. Market forces, technological advancements and a desire for more efficient and cost-effective management drove the development and application of infrastructures and societal functions following the end of the Cold War. Gradually and in some degree simultaneously to this development the awareness of society's technological dependency increased. In Norway the concept of "a vulnerable society" was established following the report by the government commission on the vulnerability of society headed by former Prime Minister Kåre Willoch, published in 2000.

The challenges related to "a vulnerable society" are as present today as they were in 2000. "New" challenges to our safety and security such as terrorism and the consequences of technological failures, space weather or climate change relate to the society as a whole and constitute a particular challenge to enterprises that are responsible for critical infrastructures and critical societal functions. Those enterprises must be able to deal with both new and old challenges to safety and security, whether they are caused by antagonistic or non-antagonistic threats. Rapid shifts in society, as well as a high demand for profit and production makes it important to be able to adapt quickly to meet new professional, technological and organizational demands. At the same time, the process of adaptation must not be limited to ensuring that only these demands are met. It is equally important to ensure that the interests of national security and other interests that are considered vital to the nation are safeguarded. This is something that enterprises with a well defined culture of security are more capable of doing. The authorities must ensure that the all of these different changes, across different sectors or within one sector, do not reduce the overall safety and security of society.

The choice of public ownership as an instrument to ensure that the interests of national security and other interests that are considered vital to the nation are safeguarded, must be based on comprehensive assessments, where the desire for public control is weighed against potential economic benefits introduced as a result of privatization. When assessing ownership of critical infrastructures and critical societal functions, considerable emphasis must be given to the special circumstances that are necessary for ensuring an acceptable level of safety and security of society. Norway is generally a safe and a secure country. We are accustomed to important goods and services being delivered according to our demands, and in a safe and secure way Still, the high degree of complexity and dependency on critical infrastructures and critical societal functions makes it difficult to predict what can go wrong, and what the consequences of disruption in these infrastructures and functions are. In this perspective, the consequences of what can go wrong must be emphasized more than the likelihood of the incident happening. Therefore, measures for the protection of critical infrastructures and critical societal functions require the highest priority and thorough preparation, even if the theoretical probabilities of incidents happening are low.

In order to protect critical infrastructures and critical societal functions, legal requirements given by the supervisory authorities to businesses must be clear and the supervision and control that is carried out must be as efficient as possible. At the same time, businesses need to be aware of their own responsibilities. In any case, as citizens of a vulnerable society, we must all be prepared for disruptions in the supply of important goods and services. The work on protection of critical infrastructures and critical societal functions is about protecting those services that are necessary for the basic needs of society, and to maintain the feeling of safety and security.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Karel Schrijver, Ph.D.*

Position: *Senior Fellow*

Organization: *Lockheed Martin Advanced Technology Center*
3251 Hanover Street
Palo Alto, CA 94304. USA

Date of Birth: *19.08.1958*

Nationality: *Netherlands*

Phone: *+1-650-424-2907*

E-mail: *schrijver@lmsal.com*

Biography:

Karel Schrijver received his doctorate at the University of Utrecht on the topic of solar and stellar magnetic activity. After postdoctoral appointments at the University of Colorado and the European Space Agency, and a fellowship of the Royal Netherlands Academy of Sciences, he now is senior fellow at the Lockheed Martin Advanced Technology Center. His research focuses on the magnetic activity of the Sun, the coupling of the Sun's magnetic field into the heliosphere, the manifestations of magnetic activity of other Sun-like stars, and the impact of solar variability on society.

In addition to scientific research, he is actively involved in developing and operating space instrumentation: he was the science lead and later the Principal Investigator for the Transition Region and Coronal Explorer (TRACE) and for the Atmospheric Imaging Assembly (AIA) of the Solar Dynamics Observatory (SDO), and co-investigator on the Helioseismic and Magnetic Imager (HMI) on SDO and on the Interface Region Imaging Spectrograph (IRIS) SMEX project.

He has served in NASA advisory functions, including the NASA Sun-Earth Connection strategic planning (RoadMap), the NASA Living-With-a-Star (LWS) advisory structures, and the NASA Heliophysics Subcommittee (2010-…). He was a member of the NRC Space Studies Board (2002-2005).

His interests include disseminating newly developed understanding of our neighboring star and its influence on society to students and the general public. He co-authored the first textbook on solar and stellar magnetic activity and defined and led the first phase of the Heliophysics Summer School that resulted in a textbook series on heliophysics as an integrated science.

Professional publications: Refereed Journals - 126, Monographs/textbooks/proceedings –7, Invited conference reviews - 28.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Speaker: ***Karel Schrijver***

Title of Presentation: ***Estimating the Economic Impact of Disturbances in the U.S. Electric Grid Associated with Solar Activity***

Session: ***Society's Ability to Withstand Short and Long Term Shut Down of Critical Infrastructure***

Abstract:

Large solar explosions are responsible for space weather that can impact technological infrastructure on and around Earth. Such impacts are known to occur in association with infrequent unusually large solar events. We find that impacts also occur in association with much more common solar events and geomagnetic disturbances: between 1992 and 2010, approximately 4% to 9% of grid disturbances reported to the U.S. Department of Energy are associated with relatively common M- or X-class flaring and their ensuing geomagnetic activity. As none of the grid disturbances were officially attributed, in whole or in part, to space weather in the reports, our study suggests an unrecognized susceptibility of the US electric grid to solar activity. If the sample of grid disturbances studied here is characteristic of the grid disturbances included in an economic assessment study by the electric power industry, our study suggests that the average cost to the U.S. economy of space-weather induced grid disturbances may amount to 3 billion per year and plausibly substantially more. The apparent magnitude of this economic impact warrants extensive follow-up studies to validate and understand the weak but significant contribution of the space-weather background conditions as one of the factors in disturbances in the US electric power grid.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Genene Fisher, Ph.D.*

Position: *Senior Advisor for Space Weather*

Organization: *NOAA National Weather Service*
Silver Spring, MD
USA

Nationality: *USA*

Phone: *+1 301 713 1706*

E-mail: *genene.fisher@noaa.gov*

Biography:

Dr. Genene Fisher, Senior Advisor for Space Weather at the NOAA National Weather Service (NWS), is responsible for leading space weather policy and programmatic activities within NWS HQ. She integrates space weather operations into agency policies and procedures and is expanding space weather related activities within NOAA. She collaborates with other federal agencies, private companies, academia, and international organizations to help build resilience of our critical infrastructure to solar storms. Genene Fisher currently serves as co-chair for the U.S. National Space Weather Program Committee on Space Weather.

Previously to joining NOAA, Genene Fisher spent ten years as a Senior Policy Fellow at the American Meteorological Society's Policy Program, where she focused on space weather policy issues and societal impacts. Genene Fisher worked closely with industry, including the GPS and aviation communities, on how to integrate space weather information into operations. She routinely met with policy makers to highlight the importance of space weather and offered recommendations on how to reduce adverse impacts to customer systems. She successfully expanded space weather activities within the AMS organization, resulting in the formation of the Space Weather STAC Committee and the annual Space Weather Conference. At the AMS, Genene Fisher also developed science policy curriculum material to educate the next generation of scientists in the policy process. She taught science policy courses as an adjunct professor at several universities.

Genene Fisher has a PhD in Atmospheric and Space Science and a Masters of Public Policy from the University of Michigan. She also has a BA in Planetary and Space Science from Boston University.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Speaker: ***Genene Fisher***

Title of Presentation: ***Preparing the U.S. to Respond to Space Weather Events***

Session: ***Authorities Handling Strategies and Contentious Level***

Abstract:

The rapid advances in the technology sector and our fast growing dependency on space-based systems have resulted in an ever-increasing vulnerability to space weather. The scope of effort required to address the challenges is beyond the capability of any single agency, so the U.S. Government has established collaboration among its space weather agencies: the Unified National Space Weather Capability (UNSWC). UNSWC will leverage agency efforts by aligning programs, enhancing communications, and opening opportunities for joint work that benefits the public. It will also help us to establish stronger linkages internationally.

As part of this initiative, NOAA is addressing rapid changes in its space weather customer base by understanding and responding to the evolving needs and requirements of a global high-tech economy. The rapidly growing customer base requires improved forecasting skills to support the diverse user areas, including national security, aviation, emergency response, communications, satellite navigation applications, spacecraft operations, space exploration, and electric power grids. This presentation will focus on how NOAA is working closely with industry, agency partners, and international organizations to increase awareness of how space weather can disrupt critical infrastructure and prepare the nation for responding to space weather events.

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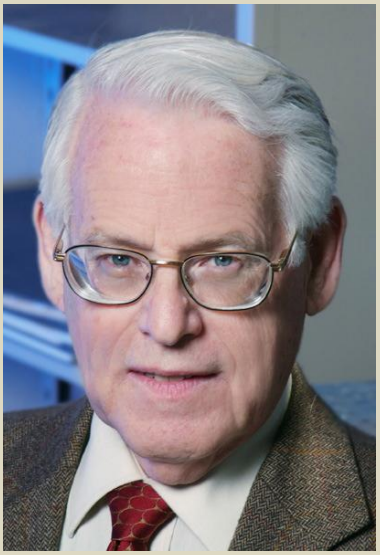
Oslo Conference 2012 Keynote Speaker Biography



Name: ***Alan Title, Ph.D.***

Position: **Senior Fellow**

Organization: ***Lockheed Martin Advanced Technology Center***

Date of Birth: 10 February 1938

Nationality: ***USA***

Mobile: +1 650 644 6030

E-mail: ***title@lmsal.com***

Biography:

Education

Ph.D., Physics, l966, California Institute of Technology and B. A., Mathematics, l960, University of California, Los Angeles

Employment

l971- Lockheed Martin Corporation

Responsible for the direction of Lockheed Solar Observatory. Research on Solar magnetic and velocity fields, on optical interferometers in particular ultra narrow optical filters, on high resolution observations using active and adaptive optical systems, and on data analysis systems for image analysis. Development of ground and space based instruments for solar physics research.

l967-7l Harvard University, Research Associate

Principal scientist for ATM H-alpha experiment. Responsible for basic scientific specifications and scientific progress of instrument in construction and checkout. Other activities included studies of velocity and magnetic fields in the solar atmosphere and teaching.

l966-67 Smithsonian Astrophysical Observatory, National Academy of Sciences

Research Fellow. Research on the velocity structure of the H-alpha chromosphere.

Awards and Honors

Phi Beta Kappa
National Academy of Engineering
National Academy of Sciences
International Academy of Astronautics
Space Science Metal, American Institute Aeronautics and Astronautics, 1990
James Arthur Lectureship Harvard University, 1991
NASA Group Achievement Award, l998 (SOHO mission)
NASA Group Achievement Award, l999 (TRACE mission)
NASA National Resource Award, 1999
NASA Public Service Medal, 2000
LMMS Dan Tellep Award for Career Excellence, 2000
Aviation Week Laurels, 2000
Hale Prize American Astronomical Society, 2001
Public Science Writing Award American Astronomical Society, 2001
George W. Goddard Award SPIE, 2007
NASA Exceptional Science Achievement Medal

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Alan Title***

Title of Presentation: ***Remote Triggering of Energetic Events***

Session: ***Predictions of Solar Storms, Warnings, Preparedness Measures and Response***

Abstract:

The Atmospheric Imaging Assembly (AIA) on the Solar Dynamic Observatory (SDO) together with the Helioseismic and Magnetic Imager (HMI) and the Extreme Ultraviolet Variability Experiment (EVE) allow observations of the entire Sun from 6000 K to 20,000,000 K with arcsecond resolution and a 12 second cadence (A!A), obtain doppler and continuum images at a 45 second cadence and Line of Sight and vector magnetograms (HMI) every few minutes, and integrated solar spectra from 1 to 100 nm on a 2 second cadence (EVE) 24/7. Because of the enhanced thermal and temporal coverage and the high dynamic range available with AIA, it has been able to discovery collective behavior associated with extreme solar events that are driven by the expansion of magnetic structures. Nearly half of the M and X class flares seen with AIA have impact over a solar hemisphere and sometimes nearly the entire sphere. The extent of the events is possible by using co-temporal STEREO data. The rapidly expanding magnetic structures, speeds between 500 and 2000 km/s, trigger filament eruptions, CME's, and other flares. These "triggered" events are sometimes larger that the initial disturbance. The remote triggering makes flare prediction based upon local energy build up models less valuable, but suggests that with proper coverage prediction of solar events with potential for Earth impact can be made more reliable. Movies of sample events discovered in AIA together with STEREO and EVE data will be shown.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Brandon D. Wales*

Position: *Director of the Homeland Infrastructure Threat and Risk Analysis Center (HITRAC)*

Organization: *U.S Department of Homeland Security, National Protection and Programs Directorate, Office of Infrastructure Protection*
Washington, DC
United States of America

Nationality: *USA*

Mobile: +1-*703-235-2877*

E-mail: *brandon.wales@hq.dhs.gov*

Biography:

Brandon Wales is the Director of the Homeland Infrastructure Threat and Risk Analysis Center (HITRAC), which under Mr. Wales' leadership has grown to become a robust all-hazards analytic resource for public and private sector partners covering the full-array of risks and challenges facing the infrastructure community.

Mr. Wales also oversees the Department's advanced modeling, simulation, and analysis program at the National Infrastructure Simulation and Analysis Center (NISAC), where researchers from the Los Alamos and Sandia National Laboratories conduct ground-breaking and forward-leaning analysis of some of the Nation's most complex infrastructure challenges.

When the Department began working on the first Quadrennial Homeland Security Review, Mr. Wales was also asked to lead the review of the counterterrorism and cyber security mission areas.

Prior to joining the Department, Mr. Wales served as the principal national security advisor to United States Senator Jon Kyl and as a Senior Associate at a Washington-based foreign policy and national security think-tank.

Mr. Wales received his Bachelor's degree from George Washington University and his Master's degree from Johns Hopkins School of Advanced International Studies.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Brandon Wales***

Title of Presentation: ***Risk Analysis of Severe Space Weather Events to U.S. Critical Infrastructure***

Session: ***Society's Ability to Withstand Short and Long Term Shut Down of Critical Infrastructure***

Abstract:

One of the primary mission areas at the U.S. Department of Homeland Security's (DHS) is U.S. critical infrastructure protection. In support of this mission, DHS produces timely and technically defensible risk analysis on a number of potentially adverse events to U.S. infrastructure while also identifying risk management options for consideration for homeland security partners. The risks from many natural disasters to U.S. infrastructure can be extrapolated from historical frequency and consequence data. However, space weather risk analysis is inherently difficult due to the low frequency of severe space weather events and the rapid development of a complex and interconnected U.S. electric grid, global positioning systems, and satellite technology over the past several decades. To address this issue, DHS formed a task force in 2011 to collect and synthesize public sector and industry findings on severe space weather events. Among the over 250 studies, models, and initiatives that have been identified, the task force found that key analytical assumptions have led to a wide spectrum of results about space weather consequences and U.S. infrastructure vulnerabilities that lead to high analytical uncertainty. This presentation will discuss the path forward for risk analysis of extreme space weather events at DHS, including the development of a key national space weather risk profile for U.S. infrastructure, and the need for specific types of analysis in the future to address current analytical gaps.

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Oslo Conference 2012 Keynote Speaker Biography

Name: *Mike Hapgood*

Position: *Professor and Head of Space Environment Group*

Organization: *RAL Space*
STFC Rutherford Appleton Laboratory
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Nationality: *UK*

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Biography:

Mike Hapgood is Head of the Space Environment Group at RAL Space, which is one of the UK's major space research groups and is based at the STFC Rutherford Appleton Laboratory in Oxfordshire. He is also a Visiting Professor at Lancaster University, working with the Space Plasma Environment and Radio Science group in the university's physics department. He is an internationally recognised expert in space weather, e.g. he has led a number of space weather studies funded by the European Space Agency and is a past chair of ESA's Space Weather Working Team. More recently he has been active in providing advice to UK Government bodies looking at the risks from space weather and is Chair of the Space Environment Impacts Expert Group that now acts as a focus for that advice to Government. He was also lead author on a 2010 report on space weather impacts on business, published jointly by Lloyds 360 Risk Insight and RAL Space. In March 2011 he gave the IET's 2011 Kelvin Lecture on the subject of "Space Weather: Nature's electromagnetic hazard". He has a strong scientific interest in the occurrence of extreme space weather events and, in particular, in expanding our knowledge of the physics at work in such events as that may provide important insights into the these rare and dangerous events.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Mike Hapgood***

Title of Presentation: ***Building Space Weather Preparedness and Resilience in Europe***

Session: ***Future Developments and Expectations***

Abstract:

Space weather is a set of phenomena now recognised as a significant natural hazard, with the potential to disrupt many technologies that are critical to the functioning of modern societies. It arises when phenomena on the Sun and in near-Earth space generate adverse environmental conditions for technologies operating in space, in Earth's atmosphere and on the surface of our planet. As a result the space weather community has focused significant effort on building links with the operators of those technologies – to raise awareness of the impacts of space weather and to explore how science can be applied to mitigate those effects. However, it is now clear that space weather is also an issue for governments because many of the technologies impacted by space weather support critical national infrastructures such as power, aviation, satellite timing and location, and a host of other satellite-based services. Thus space weather is integral to the analysis and planning of national and international resilience against natural hazards. Thus this talk will argue that efforts build space weather preparedness in Europe must engage governmental risk managers and policy-makers, as well as end users in industry, and link with their efforts to mitigate other natural hazards. Space weather should be integrated into an all-hazards approach as is already being considered in Sweden and the UK. The space weather community has much to give to, and much to learn from, such engagement.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: *Timothy Cook*

Position: *Chair of Work Group*

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Mobile: *+01-2022581746*

E-mail: *CookTJ@state.gov*

Biography:

Tim Cook is an international information technology expert. Currently he is U.S. representative to the NATO Civil-Military Planning Support Industrial Resources and Communications Services Group.

He has been working for the foreign service of the U.S. Department of State managing telecommunications programs at U.S. embassies. After receiving numerous awards for managing technology upgrades in Santiago, Berlin, Jakarta, Tegucigalpa, and The Hague, he returned in 2007 as a division chief managing teams of project managers who installed telecommunications networks at U.S. missions worldwide.

In 2010 he accepted a detail to the U.S. Department of Homeland Security National Programs Protection Directorate Cyber Security and Communications office. During this time he was supporting interagency communications disaster coordination issues. He introduced the threat of solar storms to the NATO Civil Emergency Planning subcommittee via a paper in 2010.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Timothy Cook***

Title of Presentation: ***Severe Space Weather NATO Relevance Civil-Military Emergency Planning Communications Considerations***

Session: ***Authorities Handling Strategies and Contentious Level***

Abstract:

The impact of severe solar storms poses a threat to civil and military communications systems. Societies and their Defense depend upon the ability to communicate to survive. It is the mission of NATO to defend us in emergencies. There is a dependence upon communications and the underlying power systems that is universal and fragile. Planning for the inevitable solar event is the job of civil emergency planners and civil-military operations planning support.

Monitoring space weather to provide early warnings about solar storms that upset the electrical grids, satellite systems, and other communications services can reduce the threat and destruction and help mitigate the impacts. Understanding the storm effects is required of everyone, but providing protection for the critical recovery efforts is the role of NATO.

NATO's mission includes protection of the populations. To do this, it must guard the way for the civilian communications providers and the energy suppliers to access the infrastructure that requires repair or fuel after a solar disaster. Interoperability is fundamental for us, and in this presentation there are references to common disaster planning tools recommended to NATO Allies and Partners via the Industrial Resources and Communications Services Group.

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Oslo Conference 2012 Keynote Speaker Biography

Name: *Brage W. Johansen*

Position: *Chairman*

Organization: *Space & Energy*
Prof. Olav Hanssens vei
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Date of Birth: *11.08.1971*

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Biography:

Brage W. Johansen, VP in IRIS - International Research Institute of Stavanger, responsible for Strategic projects as of today including projects in Deep Geothermal, Space technologies and Environmental monitoring. Johansen has business experience as technology- and business developer with management positions in Statoil from 1996-2009. Several board positions in start-up companies and other organizations. Among other things Johansen were responsible for the first public hydrogen and hythane fuel station in Norway, and has produced the Norwegian hydrogen concept sports car FYK (try google it).

Johansen is the cofounder and current chairman of the innovation network Space & Energy / ThinkOutsideThePlanet that facilitates innovation partnerships between energy- and space-companies. The main focus is co-development of new technologies, techniques and competences for use both on Earth and other space objects.
Space & Energy (www.spaceandenergy.no) has resulted in the project Deep Drilling on Mars, two Planetary Drilling Workshops, several Space & Energy conferences and one Safety & Risk management workshop together with Seros (IRIS together with University of Stavanger has established SEROS - Centre for Risk Management and Societal Safety).

Johansen is a Master of Computer Science from NTNU. Engineer at heart, but has also studied psychology, business, philosophy and astronomy.

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Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Brage W. Johansen***

Title of Presentation: ***Crisis Management Tools as Common Ground for Space- and Energy Sector***

Session: ***Authorities Handling Strategies and Contentious Level***

Abstract:

Both the Space sector and the Energy sector face many of the same challenges when operating in harsh, remote, critical environments, being it drilling in the deep sea or arctic or driving rovers on Mars.

The innovation network Space & Energy work to build new and share technology, competence and techniques. Especially this involves drilling operations, both on Earth and other places in our solar system.

Crisis management is also a very important field of common interest, and in the presentation Johansen will describe how S&E works with both sectors to find common solutions.

The main subject is the presentation of the research project IMMER - Information Security Incident Management and Emergency Preparedness in ICT-based Operations. This is one of Norway's largest research projects about crisis management and its main focus is when the ICT infrastructure fails. This project is headed by the Norwegian company Intrapoint (www.intrapoint.com) / CTO Tore Andre Nilsen.

Conference Sponsors & Supporters:

Oslo Conference 2012 Keynote Speaker Biography

Name: **Joseph M. Davila**, ***Ph.D.***

Position: ***Senior Scientist***

Organization: ***Heliophysics Division, NASA-Goddard Space Flight Center***

Date of Birth: ***December 30th, 1948***

Nationality: ***American***

E-mail: *joseph.m.davila@nasa.gov*

Biography:

Joseph Michael Davila is currently as Astrophysicist in the Solar Physics Branch at Goddard Space Flight Center in Greenbelt, Maryland. Born December 30, 1948, Dr. Davila earned a BS in Mechanical Engineering from Lamar University, Beaumont, TX in 1972, a BS in Physics from the University of California, Irvine in 1978 and a PhD in Astronomy from the University of Arizona in 1982. He is a member of the American Astronomical Society, the American Geophysical Union and the International Astronomical Union. His research interests have included the linear and non-linear theory of hydromagnetic waves; hydromagnetic instabilities due to energetic particle beams, resonance absorption in inhomogeneous plasmas, the acceleration of high speed wind streams in solar and stellar coronal holes, and plasma heating in closed magnetic structures. Dr. Davila has also published research on the acceleration of cosmic rays, the transport of energetic, particles within the Galaxy, the modulation of Galactic cosmic rays by the solar wind and the propagation of solar cosmic rays in the interplanetary medium. Dr. Davila was Principal Investigator for the Solar Extreme-ultraviolet Research Telescope and Spectrograph (SERTS), he was the Project Scientist for STEREO, and is the lead scientist for COR1 on the STEREO mission, and Co-I on the Hinode and Solar orbiter missions.

Oslo Conference 2012 Keynote Speaker Presentation

Keynote Speaker: ***Joseph M. Davila***

Title of Presentation: ***Space Weather Activities within NASA***

Session: ***Introduction to Space Weather***

Abstract:

Space weather affects all phases of NASA operations, human space flight, robotic missions, launch activities, and aeronautics. In addition space weather is critical in all of the environments where NASA operates, in the atmosphere, in Geospace, in low Earth orbit, in medium Earth orbit, in geostationary orbit, in lunar orbit and on the lunar surface, in the Heliosphere, and in planetary orbits and surface all at solar minimum and at solar maximum. Because of this, NASA has organized an effort to obtain the best space weather data possible, to incorporate those data into predictive models, and to disseminate the resulting information to responsible parties within the Agency. Details of this process will be discussed in this talk.

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