Applied Physics
Earth, Atmosphere and Environmental Physics
(combined session)

Monday, 30.06.2014, Room F 130

Time	ID	**Combined Session** *Chair: Stéphane Goyette, Uni Genève*
13:45	**451**	**Nonlinear fast growth of surface gravity waves under the action of wind** *Maura Brunetti* *Inst. for Environmental Sciences, University of Geneva, Route de Drize 7, 1227 Carouge* In the wind-driven wave regime, the Miles mechanism gives an estimate of the growth rate of the waves under the effect of wind. We consider the case where this growth rate is of the order of the wave steepness. Using the method of multiple scales, we derive the nonlinear Schroedinger equation in this regime of fast-growing waves. We find that the Peregrine and Akhmediev soliton solutions show an enhancement of both their lifetime and maximum amplitude which is in qualitative agreement with the results of tank experiments and numerical simulations of dispersive focusing under the action of wind.
14:00	**452**	**Wind gusts over Switzerland:** **parametrization of extreme events with the Canadian Regional Climate Model** *Charles-Antoine Kuszli, Stéphane Goyette, Martin Beniston* *University of Geneva, ISE, 7bis route de Drize, 1227 Carouge* Severe winds recorded during a number of winter storms are simulated over the period 1990 to 2011 with the Canadian Regional Climate Model (CRCM) at a high spatial resolution. Flow fields are first downscaled from NCEP-NCAR reanalyses and then down to 2-km grid spacing in the horizontal through a self-nesting technique. During this last step, different windgust schemes of different complexities were tested and their performances compared one to each other and to observations from MeteoSwiss national network. Simple schemes reproduced the surface observations in an overall realistic manner but differences are noticed in the hourly maximum values. In order to improve the scheme in operational use at MeteoSwiss, an an empirically fixed parameter in the formulation is now allowed to vary in the horizontal where values have been calibrated using the MeteoSwiss stations hourly wind maximum. The performance of this method is shown to be closely related to the analysis of the main flow regimes in Switzerland during which the storms are simulated. An application of this modified gust scheme for numerical weather prediction modelling is envisaged in the near future.
14:15	**453**	**Miniature LIMS system designed for sensitive in situ measurements** **of the chemical composition of solid materials on solar system objects** *Andreas Riedo, Maike Brigitte Neuland, Marek Tulej, Peter Wurz* *University of Bern, Sidlerstrasse 5, 3012 Bern* Knowledge of the chemical composition of surfaces of solar system bodies is of primary importance to understanding of the origin and evolution of our solar system. Development of dedicated instrumentation for in situ chemical analysis of planetary solids is of primary importance to current space research. A miniature laser ablation/ionisation mass spectrometer, LMS, developed in our group is a space prototype instrument with the capabilities similar to large laboratory systems and can be applied directly on air-less planetary surfaces. This instrument can be also easily adopted for many different terrestrial field applications. The performance of LMS will be discussed in detail. Ref.: A. Riedo et al., J. Anal. At. Spectrom., 2013, 28, 1256 – 1269.; A. Riedo et al., Planet. Space Sci., 2013, 87, 1 – 13.

14:30	**454**	**Implementing a spin rotator in a spin-polarized scanning electron microscope** *Benedikt Böhm, Andreas Bischof, Rolf Allenspach* *IBM Research Zurich, Säumerstrasse 4, 8803 Rüschlikon* A part of recent research concentrates on the field of magnetic devices. In order to investigate such structures we use spin-polarized scanning electron microscopy [1], in which a Mott analyzer is used to simultaneously determine two components of the spin polarization vector. To detect the third component we implemented a spin rotator [2], which is capable of rotating the electron spin by 90° with crossed electric and magnetic fields. With a 3D electron optics software, we traced the electron paths in such a rotator. Based on this, a spin rotator was designed and built into the system. First tests show proper functioning, as verified by observing magnetic domain patterns.
14:45	**455**	**Characterization of an Electron Cyclotron Maser for enhanced Nuclear Magnetic Resonance (NMR)-Spectroscopy** *Falk Braunmüller, Stefano Alberti, Trach-Minh Tran, Jérémy Genoud, Jean-Philippe Hogge, Minh Quang Tran, CRPP, EPFL, Station 13, 1015 Lausanne* A full characterization of an Electron Cyclotron Maser (ECM), designed and constructed for Dynamic Nuclear Polarization (DNP)-enhanced NMR-spectroscopy, will be presented. After a general introduction to ECM-type microwave sources, the most important features of the prototype for its use in spectroscopy are described. Novel dynamical regimes of ECMs, exhibiting nanosecond radiation pulses, have been predicted by theoretical models and experimentally confirmed [1]. A detailed comparison between theory and experiment will be shown. [1] S. Alberti, F. Braunmueller, T.-M. Tran, J. Genoud, J.-P. Hogge, M. Q. Tran, and J.-P. Ansermet, Physical Review Letters 111, 205101 (2013).
15:00	**456**	**Research activities at new Bern PET cyclotron** *Konrad Nesteruk, Saverio Braccini, Antonio Ereditato, Paola Scampoli* *AEC-LHEP, University of Bern, Sidlerstrasse 5, 3012 Bern* The new cyclotron laboratory for radioisotope production and multi-disciplinary research at the Bern University Hospital (Inselspital) is based on an 18 MeV proton accelerator, equipped with a specifically conceived 6 m long external beam line, ending in a separate bunker. This unique hospital based facility allows performing daily Positron Emission Tomography (PET) radioisotope production and research activities running in parallel. The first year of operation will be reported with focus on the latest developments on novel detectors, radiation biophysics, radioprotection, radiochemistry and radiopharmacy.
15:15	**457**	**Investigation of Charge Separation Dynamics in Organolead Halide Perovskite Solar Cells** *Mahmoud Hezam [1], Gwenole Jacopin [1], Mehran Shahmohammadi [1], Peng Qin [2], Saif Qaid [3], Idriss Bedja [3], Jean-Daniel Ganiere [1], Abdullah Aldwayyan [3], Mohammad Khaja Nazeeruddin [2], Michael Grätzel [2], Benoit Deveaud [1]* *[1] EPFL, Lab. of Quantum Optoelectronics, Inst. of Condensed Matter Physics, 1015 Lausanne* *[2] EPFL, Lab. of Photonics and Interfaces, Inst. of Chemical Sciences & Engineering, 1015 Lausanne* *[3] King Saud University, Dep. of Physics and Astronomy, College of Science, SA-11451 Riyadh* In this work, time-resolved photoluminescence (TRPL) and laser flash photolysis were used to study the charge transfer dynamics at perovskite/TiO_2 and perovskite/Al_2O_3 interfaces, in perovskite solar cells. TRPL results showed a fast decay (decay times ~100 ps and ~1 ns) of the PL signal, that is almost independent of the metal oxide layer. Laser flash photolysis, on the other hand, showed a long few millisecond decay time of the transient absorption signal for both samples. The results indicate that the electron-hole pairs are rapidly separated within the perovskite, but are long-living after that as separated species.
15:30		
16:00		***Coffee Break, END***
18:15		***Postersession and Apéro***
20:15		***Public Lecture***

ID	Earth Atmosphere and Environmental Physics Poster
461	**A coupled single column lake and atmospheric model to simulate thermal profiles in Lake Geneva** *Marjorie Perroud, Stephane Goyette, Institute for Environmental Sciences, 7, rte de Drize, 1227 Carouge* A single column atmospheric model coupled to a single column lake model with an application to Lake Geneva is presented. The atmospheric model, FIZC, is a column isolated from the Canadian Regional Climate Model (C-RCM). This atmospheric model is thus physically-based and it requires outputs from a previous C-RCM integration driven by NCEP-NCAR reanalyses. The lake model, called SimStrat, combines a buoyancy-extended k-ϵ model with a seiche excitation and damping model to predict the diffusivity below the surface mixed layer. Details of the atmospheric-lake interface module and sensitivity of the simulated thermal profiles to this coupler parameters are presented for two case studies.