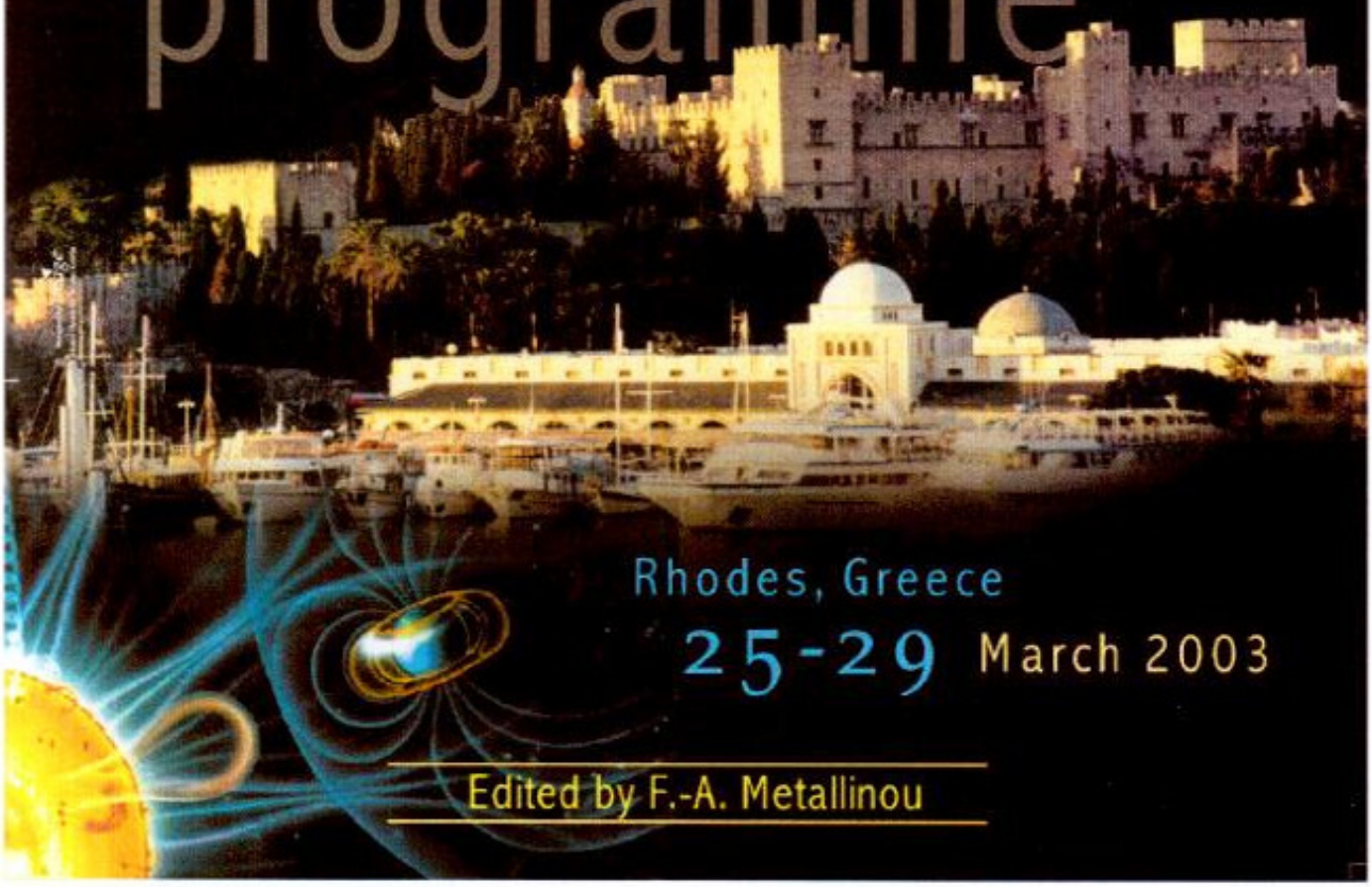
Effects of Space Weather on Technology Infrastructure

NATO Advanced Research Workshop

Effects of Space Weather on Technology Infrastructure

PROGRAMME and ABSTRACT BOOK

programme



Rhodes, Greece

25-29 March 2003

Edited by F.-A. Metallinou

NATO Advanced Research Workshop on

Effects of Space Weather of Technology Infrastructure

ESPRIT

Programme and Abstract Book

ARW Directors

Ioannis A. Daglis
Institute for Space Applications & Remote Sensing, National Observatory of Athens

Mikhail I. Panasyuk
Skobeltsyn Institute of Nuclear Physics, Lomonosov Moscow State University

Scientific Organizing Committee

Daniel N. Baker, University of Colorado
Ioannis A. Daglis, National Observatory of Athens
Eamonn Daly, European Space Agency
Gregory P. Ginet, Air Force Research Laboratory
Bertrand Huet, Alcatel Space Industries
John G. Kappenman, Metatech Corporation
Mikhail I. Panasyuk, Moscow State University

Local Organizing Committee

Ioannis A. Daglis, National Observatory of Athens
George Karagiannidis, National Observatory of Athens
Konstantinos Koutroumbas, National Observatory of Athens
Fiori-Anastasia Metallinou, Aristotle University of Thessaloniki
John N. Sahalos, Aristotle University of Thessaloniki
Kanaris Tsinganos, National University of Athens

Feedback between the solar wind and the solar magnetic field

P.L. Israelevich, A.I. Ershkovich

Department of Geophysics and Planetary Sciences, Tel Aviv University, Ramat Aviv, 69788, Israel

The feedback between the solar wind and solar magnetism seems to exist. The magnetic flux is transported by the solar wind flow, and the amount of the flux transferred during 11 years is of the same order of magnitude as the flux of the main solar magnetic field through the northern hemisphere of the Sun. This feedback may be due to the radial current of total strength of ~3 10^9 A which exists in the heliospheric current sheet. The only way to fulfill the electric current continuity is to close the radial electric current by means of field-aligned currents at the polar region of the Sun. The surface density of the closure current flowing along the solar surface is ~ 4 A/m, and the magnetic field produced by this current is B ~ 5×10^{-6} T, i.e. several percent of the main solar magnetic field. Thus, numerical simulations of the space weather as well as treatments of the solar magnetic field generation should take into account the connection between the heliospheric current circuit and the currents flowing inside the Sun.

Space weather effects in the ionosphere deduced from ground and space based GNSS measurements

?. Jakowski, A. Wehrenpfennig, S. Heise, S. Stankov

Deutsches Zentrum fuer Luft- und Raumfahrt (DLR), Institut fuer Kommunikation und Navigation, Kalkhorstweg 53, 17235 Neustrelitz, Germany

The ionosphere plays an active role in the complex space weather relationships. Hence, permanent monitoring of the ionospheric state on a global scale is required for improving satellite-based navigation and positioning. GNSS measurements, both ground and space based, offer the unique chance for a permanent monitoring of the total ionization (Total Electron Content - TEC) of the global ionosphere/plasmasphere region up to about 20000 km height. We report and discuss space weather induced large scale ionospheric phenomena observed over the European area as well as over both polar regions where ionospheric perturbations are strongly coupled with solar wind and magnetospheric processes (http://www.kn.nz.dlr.de/). While discussing selected events (e.g. geomagnetic storm on 6 April 2000) it will be shown that the TEC is very sensitive to perturbation-induced electric fields and thermospheric state changes. Furthermore, TEC correlates closely with space environment data measured onboard geo-stationary satellites. Accompanying signal phase irregularities that degrade navigation and positioning applications indicate highly variable temporal and spatial structures. Therefore, a permanent monitoring of TEC and related quantities can provide an appropriate estimate of space weather impacts on GNSS based navigation and positioning. General features of ionospheric storms are useful to be implemented in perturbation models to improve forecasting of TEC-variations under perturbed conditions. Operational requirements for space weather nowcast and forecast are discussed as well.