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**UAMPY (Upper Atmosphere Monitoring for Polar Year 2007-2008)
A draft proposal**

by

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Reference Theme 5, according to “Initial Outline Sciences Plan”: “*To use the unique vantage point of the polar regions to develop and enhance observatories studying the Earth's inner core, the Earth's magnetic field, geospace, the Sun and beyond*”.

INTRODUCTION

To investigate the upper atmosphere polar physics and give useful tools for radio communication and satellite navigation users it's necessary to collect several kinds of experimental data, develop realistic models and mostly make available in real time useful indices and alerts. In the IPY frame UAMPY idea is to create the necessary international cooperation to develop a polar upper atmosphere observation network and improve scientific joint efforts to develop databases, models and real time data accessibility for space weather purposes. This proposal hopes for an integration of interested upper atmosphere scientific groups.

GROUP RESOURCES AND ACTIVITIES

The UAMPY is actually proposed by four groups with a long experience in polar and auroral experiments and studies. Below a brief description of every participant is reported pointing out the polar activities and resources actually available:

- The INGV (Istituto Nazionale di Geofisica e Vulcanologia – Rome, ITALY) group performs experimental observations at polar latitudes since 1990. Terra Nova Bay, now “Mario Zucchelli Base”, (Antarctica, geographic coordinates: 74.69°S, 164.12°E) ionospheric observatory is now equipped with a new digisonde, AIS-Advanced Ionospheric Sounder, entirely designed and developed by INGV, and with four riometer stations for ionospheric absorption measurements at 30, 38.2 and 51.4 MHz. In the northern hemisphere the group manage a GISTM (GPS Ionospheric Scintillation and TEC Monitor) receiver station for the scintillations observation and monitoring installed at Ny Alesund (Svalbard, Norway, geographic coordinates: 78.9° N, 11.9° E) in September 2003. Within the end of 2004 the station will be integrated with other two GISTM receivers for avoiding geometrical ambiguity in the observation of the ionospheric scintillations. INGV is also involved in the frame of TANGO (Temporary Antarctic Network of Geophysical Observatories) IPY proposal.
- IFAC-CNR (Istituto di Fisica Applicata “Nello Carrara”, Florence, ITALY) has a group of ionospheric phenomenology which have been working since the late sixties about ionospheric variability at mid and high latitudes through total electron content observations. Since two decades they own a chain of four NIMS satellite receivers displaced in Italy, roughly along a meridian in Florence, L'Aquila, Gibilmanna and Lampedusa. Recently, one

of their receivers, the one located in Lampedusa, has been moved to Tromsø to study the polar ionosphere. In this moment, the group, is developing new statistical instruments to study complexity in ionospheric plasmas. in collaboration with SRC-PAS-of Warsaw.

- UNIVERSITY OF BATH. The University of Bath operates a number of radio navigation receivers in the European high-arctic. The receivers are based at the sites of the European Incoherent Scatter (EISCAT) radar in Tromsø (Norway), Kiruna (Sweden) and Sodankylä (Finland) and monitor scintillation on the signals from the GPS satellites. Three receivers are closely spaced (sub-km) and the other three are far apart (hundreds of km) to monitor ionospheric scintillation on multiple scale length baselines.
- SRC-PAS-Warsaw, Poland (SPACE RESEARCH CENTER, POLISH ACADEMY OF SCIENCES) will contribute with ionosonde, scintillation and magnetometer data collected at the Polish Polar Station located in Hornsund (Svalbard) (geographic coordinates: 77.00° N, 15.56° E) and maintained by the Institute of Geophysics, Polish Academy of Sciences. SRC will also participate in modelling of ionospheric scintillation and simulation of physical processes causing structuring of the high-latitude ionosphere.
- UNIVERSITY OF CALGARY. The University of Calgary currently operates the Canadian GPS Network for Ionosphere Monitoring (CANGIM). Three GPS reference sites in central Canada cover approximately 1500 km in the North-South direction, allowing observation of both the auroral and sub-auroral regions. These reference sites are equipped with specialized dual-frequency GPS receivers which provide estimates of scintillation parameters in addition to raw GPS observations and estimates of total electron content. Sites are currently installed at Calgary, Athabasca and Yellowknife. A fourth site is also operated at Haystack Observatory in Massachusetts, co-located with an incoherent scatter radar. Two additional GPS receivers are available for future installation at polar sites. The University of Calgary will contribute data from this network and expertise in GPS remote sensing of the ionosphere.

Table 1: list of contacting people

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OBJECTIVES

Instrumental and Technological

- Upper atmosphere monitoring by multi-instrument network at polar and auroral latitudes
- Hardware and software implementations for the remote instrument control and setting
- Severs Development and data management for:
 - near real time access to polar upper atmosphere data by ground-based stations
 - development of data flow procedure
 - validation and post-processing of the observed data
 - data bases design
 - data dissemination

Scientific

- Contribute to the investigation on Sun-magnetosphere-ionosphere interaction and neutral-ionised atmosphere coupling, in particular studying:
 - the role of the acoustic-gravity waves in the transport of mass, momentum and energy in high-latitude atmosphere
 - ionospheric variability on different temporal/spatial scales
- Modelling of ionospheric irregularities causing scintillation at polar regions
- Numerical simulation of physical mechanisms responsible for plasma structuring in the high-latitude ionosphere
- Quantifying impact of polar space weather on operational systems (such as commercial air navigation)

Educational

- scientific outreach of the polar upper atmosphere physics with educational initiatives as exhibitions, seminars addressed to the schools, schools on upper atmosphere themes, etc.

COSTS

A preliminary estimation of costs, resources and a list of potential funders are reported in Tables 2-3. **Available resources** are provided by the UAMPY proposal group (INGV, IFAC, UN. OF BATH, SRC-PAS, UN. OF CALGARY). **Needed resources** are related to a three-years financial plan (2005-2008).

Table 2

	Description	priority	cost in K€
Available resources	Human (2005-2008)		788
	Ground based monitoring instruments		530
	Telematics services		12
	Hardware devices for data processing and storage		20
		SUB TOT	1.350
Needed resources	Human	High	60
	Ground based monitoring instruments and installations	High	140
	Telematics services	Medium	50
	Hardware devices for data processing and storage	High	50
	Outsourcing support	Medium	50
	Meetings and visits	High	50
	Educational activities	Medium	30
	Publications	High	20
	SUB TOT	450	
	TOT	1.800	

Table 3

Possible bodies for funding support	Nation
PNRA (Antarctic National Research Program)	Italy
ASI (Italian Space Agency)	Italy
SCSR (State Committee for Scientific Research)	Poland
CSA (Canadian Space Agency)	Canada
CNRCan (Natural Resources Canada)	Canada
ESA (European Space Agency)	Europe
EPSRC (Engineering and Physics Sciences Research Council)	UK
PPARC (Particle Physics and Astronomy Research Council)	UK
BNSC (British National Space Center)	UK

RELEVANT REFERENCES

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