The Italian Radio Occultation experiment on-board the Indian OCEANSAT-2 satellite

F. Vespe(1), G. Perona(3), V. De Cosmo(2), R. Guzzi(2), R. Notarpietro(3), S. Casotto(4), M. Materassi(5), M. Petitta(6), P. Spalla(7), A. Speranza(8), A. Sutera(6) and N. Tartaglione(8)

(1) Agenzia Spaziale Italiana-Centro di Geodesia Spaziale -75100 Matera (I)

(francesco.vespe@asi.it, Fax :+39 0835 339005)

(2) Agenzia Spaziale Italiana- 00198 Roma

(3) Politecnico di Torino, Dipartimento di Elettronica – C.so Duca degli Abruzzi, 24 – 10129 TORINO

(4) Universit‡ di Padova - Dipartimento di Astronomia, 35122 Padova (Italy)

(5) Istituto dei Sistemi Complessi – CNR, via Madonna del Piano 10, 50019 Sesto Fiorentino (FI)

(6) Universit‡ di Roma –Dipartimento di Fisica

(7) Istituto di Fisica Applicata ìCarraraî - CNR, via Madonna del Piano 10, 50019 Sesto Fiorentino (FI)

(8) Universit‡ di Camerino, Dipartimento di Fisica, Via Madonna delle carceri 9, 62032 Camerino.

During the June, 2007 the Indian satellite OCEANSAT-2 will be launched. The Italian Space Agency (ASI) signed a Memorandum of Understandings with the Indian Space Research Organization (ISRO) in which it is agreed to put on-board the OCEANSAT-2 satellite the Italian GNSS receiver devoted to Radio Occultation (ROSA - Radio Occultation Sounder of the Atmosphere). In the framework of this mission, this instrument can only be able to observe rising occultations (the Radio Occultation antenna will be mounted on the aft-velocity direction), collecting data both in Open-Loop and in Close-Loop modes. These data will be downloaded to the Indian and the Italian receiving stations where they will be processed by the ROSA ground segment, completely developed by Italian universities and research centres. In particular, this ground segment will be implemented at a first level in an integrated computing infrastructure installed in Matera and mirrored at Hyderbad in India and, at a second level, on a distributed software and hardware infrastructure. This second infrastructure will perform the rapid and precise Orbit Determination and Prediction, the bending and impact

parameters profiles extraction, the ionospheric correction and the stratospheric initialization, the refractivity, pressure, temperature and humidity profile retrieval, the value added services for meteorology, climate and space weather applications, by computing units of each research centre or university, connected through a Web-based GRID computing infrastructure.

After a description of these two different implementations of the ROSA Ground Segment, this contribution will focus the activities carried on by the Italian institution involved in the project:

- Physics Dept. of Università di ROMA: development of climatic indexes. These activity is based on the utilization of RO data for climatic study. The main work will be focused on tropopause temperature and height determination, large scale water vapour analysis, geopotential field retrieving for dynamic indexes, evaluation and comparisonof RO data with LIDAR profiles in stratosphere.

- Physics Dept. of Università di CAMERINO: assimilation of Radio occultation data into Numerical Weather Prediction models both for real time prediction and for climatological studies. This section includes: sensitivity study on different vertical and horizontal resolution; evaluation of possible modification of forecasts by Numerical Weather Predicion Models; comparison between different vertical coordinates for assimilating RO data; study of observed and modelled gravity waves.

- CNR - Istituto di Fisica Applicata “Carrara” / Istituto dei Sistemi Complessi di FIRENZE: use of Radio Occultation data for ionospheric studies and space weather applications. Three aspects will be focused. The first one deals with the identification of new techniques which allow ionospheric compensation in the propagation delay of a single frequency signal. The second consists of monitoring the plasmaspheric total electron content as a space weather tool. The third deals with a statistical study of ionospheric scintillations introduced in the LEO-GPS links, in order to detect and model the influences of some solar/geophysical parameter on radio communications and space weather monitoring.

- Politecnico di TORINO: in the framework of the forthcoming ROSA mountain test campaign for the validation of the open-loop capabilities of the receiver, it will be carried on an activity for the identification of atmospheric induced and reflection induced patterns on the received signal. The development and the validation of an inversion scheme for ground based GPS occultation measurements is also planned.