Testing the IONORT-ISP system: a comparison between synthesized and measured oblique ionograms

Alessandro Settimi (1), Michael Pezzopane (1), Marco Pietrella (1), Cesidio Bianchi (1), Carlo Scotto (1), Enrico Zuccheretti (1), and John P. Maktris (2)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Via di Vigna Murata 605, 00143, Rome, Italy (alessandro.settimi@ingv.it),
(2) Technological Educational Institute of Crete, P.O. Box 1939 Chania, Crete, Greece

The three-dimensional (3-D) electron density representation of the ionosphere computed by the assimilative IRI-SIRMUP-P (ISP) model was tested using IONORT (IONOspheric Ray-Tracing), a software application for calculating a 3-D ray-tracing for high frequency (HF) waves in the ionospheric medium. A radio link was established between Rome (41.8°N, 12.5°E) in Italy, and Chania (35.7°N, 24.0°E) in Greece, within the ISP validity area, and for which oblique soundings are conducted. The ionospheric reference stations, from which the autoscaled foF2 and M(3000)F2 data and real-time vertical electron density profiles were assimilated by the ISP model, were Rome (41.8°N, 12.5°E) and Gibilmanna (37.9°N, 14.0°E) in Italy, and Athens (38.0°N, 23.5°E) in Greece. IONORT was used, in conjunction with the ISP and the International Reference Ionosphere (IRI) 3-D electron density grids, to synthesize oblique ionograms. The comparison between synthesized and measured oblique ionograms, both in terms of the ionogram shape and the maximum usable frequency characterizing the radio path, demonstrates both that the ISP model can more accurately represent real conditions in the ionosphere than the IRI, and that the ray-tracing results computed by IONORT are reasonably reliable.