38th COSPAR Scientific Assembly 2010

Space Studies of the Upper Atmospheres of the Earth and Planets including Reference Atmospheres (C)
Advances in Remote Sensing of the Middle and Upper Atmosphere and Ionosphere from the Ground and from Space, including Sounding Rockets and Multi-Instrument Studies (C02)

A STUDY OF MULTIPLE-FREQUENCY RANGE IMAGING OF ATMOSPHERIC VHF RADAR: EFFECTS OF RADAR BEAMWIDTH AND SCATTERER ANISOTROPY

Jenn-Shyong Chen, jschen@ctu.edu.tw
Chienkuo technology University, Changhua, Taiwan, China
Presenting author: **Jenn-Shyong Chen**, jschen@ctu.edu.tw
Chienkuo technology University, Changhua, Taiwan, China
Jun-ichi Furumoto, furumoto@rish.kyoto-u.ac.jp
Kyoto University, Japan
Takuji Nakamura, nakamura.takuji@nipr.ac.jp
National Institute of Polar Research, Tachikawa, Tokyo, Japan

Benefiting from the changeable array size and flexible radar beam direction of the Middle and Upper atmosphere (MU) radar system (34.85°N, 136.11°E), the effects of radar beamwidth and scatterer anisotropy on the performance of multiple-frequency range imaging (RIM) were examined in addition to numerical simulation. Nine transmitter/receiver modes were first employed to reveal that a wider radar beam yielded a larger phase bias in the RIM processing. Based on this, layer positions and layer thicknesses were estimated from the imaged powers of various radar beamwidths after proper corrections of phase bias and range-weighting function effect. Statistical examination showed that the imaged layer structure was thicker for a larger radar beamwidth and such feature became more evident at higher altitude. This demonstrates apparently the influence of radar beamwidth on practical performance of RIM. Second, the scatterer anisotropy in the layer structure was examined by means of vertical and three oblique radar beams (5°, 10°, and 15° north), which were transmitted in company with the RIM technique. The vertical beam observed some single-layer and double-layer structures that were not detected by the oblique beams sometimes, indicating the existence of anisotropic scatterers in the layers. In addition, a comparison of layer positions between the vertical and oblique radar beams showed that anisotropic characteristics of the upper and lower layers of a double-layer structure could be different, demonstrating one more capability of RIM to investigate fine-scale features of the atmospheric layer structures.