

## RADIO TOMOGRAPHIC IMAGING OF SPORADIC-E LAYERS

P.A. Bernhardt<sup>1</sup>, C.A. Selcher<sup>2</sup>, C.S. Siefiring<sup>1</sup>, M. Yamamoto<sup>3</sup>, S. Fukao<sup>3</sup>

<sup>1</sup>Plasma Physics Division, Naval Research Laboratory, Washington, DC 20375

<sup>2</sup>Information Technology Division, Naval Research Laboratory, Washington, DC 20375

<sup>3</sup>Radio Atmospheric Science Center, Kyoto University, Kyoto

During the SEEK 2 (Second Sporadic-E Experiment over Kyushu) two-dimensional images of Sporadic-E layers have been produced using computerized ionospheric tomography (CIT). Two rockets were launched from the Kagoshima Space Center (KSC) on August 3, 2002 at 23:24:00 JST (14:24:00 UT) and 23:39:00 JST (14:39:00 UT). Each of the two SEEK 2 rockets carried a two-frequency radio beacon that transmitted to receivers located at four ground sites. Two of the sites, Uchinoura and Taramizu were in the plane of the rocket trajectories. The rockets flew through sporadic-E layers located near 105 km altitude. The apogees of the two rockets were 151.9 and 116.6 km, respectively. The TEC measurements were obtained using differential phase from the 150 and 400 MHz carrier signals from the beacon. Because the rocket trajectory provided continuous tracking of phase absolute TEC was obtained. Data correction was required to eliminate rocket spin effects, which produced a constant differential phase, offset along with spin modulation of the phase. The latter was eliminated using a 1 Hz low pass filter. The initial data interpretation provided electron density profiles when passing through E-Layer and vertical TEC mapped to 105 km altitude along the propagation path. As the radio beacons penetrated the E-layers, sharp increases in total electron content (TEC) was observed. These data were differentiated with change in slant path to yield profiles of apparent electron density as a function of rocket altitude (see Figure). With these profiles as basis functions, tomography was used to reproduce the structure of the sporadic-E layers as a function of both altitude and horizontal range along the trajectory. Two other receivers located at Tanagashima and Tasaki were located 50 km on either side of the rocket trajectory. The data from these sites will be used to determine the three-dimensional structure of the sporadic-E layers. This experiment demonstrated the utility of a rocket-borne radio beacon sensor to detect irregularities along the propagation path between the radio beacon and a network of ground receivers.

