**Imaging of Sporadic E layers with the Poker Flat Incoherent Scatter Radar**

Craig J. Heinselman* and Michael J. Nicolls
SRI International, Menlo Park, CA, 94025

Metal ions of meteoric origin are frequently observed as sporadic-$E$ layers under a number of ionospheric conditions. At high latitudes, sporadic $E$ can be formed quite efficiently through the influence of properly directed DC electric fields. This can only occur, however, if the necessary horizontal distributions and densities of metal ions are present prior to the electric field onset. While the formation mechanism has been quite firmly established both theoretically and experimentally, the distribution and horizontal extent of these altitudinally thin layers have not yet been fully explained. Most previous studies have concentrated on the vertical compression of a horizontally uniform source of ions, arguing that the nearly constant flux of meteoric material would support that source. This, however, is somewhat at odds with the sporadic nature of sporadic $E$ as well as with the impulsive nature of measurements of meteoric ablation phenomena.

In this talk we present measurements of imaging of the dynamics of sporadic-$E$ layers as measured with the Poker Flat Incoherent Scatter Radar (the first AMISR face, designated PFISR). A radar operating mode was implemented which emphasizes the detection and full three-dimensional imaging of these layers at the cost of detailed spectral information about the returns. The advantage of this approach is that it greatly reduces the minimum detectable electron density levels and allows shorter time integrations for the more intense layers. The PFISR experiment furthermore uses the rapid beam steering capabilities of that system to produce a three dimensional picture of the formation and evolution of sporadic $E$ layers. It also interleaves a pulse suitable for the estimation of F-region electric fields (ion drifts) which are known to be instrumental in the formation of the layers, at least under many conditions.

This measurement campaign has now proceeded for all seasons. The results of both individual events and overall characteristics will be presented. Additionally, we will compare the sporadic-$E$ occurrence statistics and altitude distributions with a more extensive data set from the Sondrestrom Incoherent Scatter Radar (ISR) in Greenland. PFISR and the Sondrestrom ISR are at geographically similar latitudes (65 deg N vs. 67 deg N) but very different geomagnetic latitudes (66 deg N vs. 74 deg N). This yields similar source functions for the material at both locations (meteoroid ablation) but very different drivers (electric field orientations and magnitudes).