Rapid-run ionosonde observations of sporadic E and VHF radar backscattering

Takashi Maruyama[1], Hisao Kato[1], Maho Nakamura[1], Mamoru Yamamoto[2], Shoichiro Fukao[2]

[1] CRL, [2] RASC, Kyoto Univ.

A quasi-periodic striation pattern appearing in range-time-intensity (R-T-I) maps of radar backscattering from the sporadic-E has been extensively studied by using VHF radars, rockets, ionosondes, and satellite radio beacons in this decade. Their generation mechanism, however, is not clearly resolved yet. Coordinated observations including two rockets were conducted in Kyusyu Island, Japan in August 2002 (SEEK-2) to study the generation mechanism of the striation pattern in R-T-I maps of the radar backscattering and related upper atmospheric disturbances. During the campaign, we ran the ionosonde in its rapid-run mode at Yamagawa that is close to the rocket launch site. Ionograms were obtained every minute and foEs, fbEs, h'Es, and foF2 were scaled. Rockets were launched when intense VHF radar signals were observed. An increase in foEs was observed in accord with the period of the intense radar backscattering. During this event, foEs and fbEs varied out of phase. At the onset of the radar backscattering, foEs increased and fbEs decreased both rapidly. Prior to the onset, foEs and fbEs varied, also out of phase, periodically with a period of 10 minutes. These findings strongly suggest that the spatial inhomogeneity of electron density in the sporadic-E layer and associated polarization electric fields play an important role in the generation of radar backscattering. Also periodic variations of sporadic-E parameters prior to the onset of radar backscattering suggest that there exists some kind of fluid instability such as K-H instability modulated by a wave activity.