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An Overview on the Study of Large-scale Atmospheric Waves in the Arctic Mesosphere and Lower Thermosphere by the EISCAT and Associated Observations (Extended Abstract)

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Since August 1998, the EISCAT Svalbard radar located at 78N latitude has upgraded its capability of observing lower thermosphere down to 90 km with moderate antenna elevation by successful coding to eliminate ground clutter echoes. Quite recently, it has also been equipped with an additional fixed antenna which renders the bi-directional beam pointing almost possible in a sufficient time resolution. Along with this new polar cap radar system, the existing mainland tri-static radar in Tromso, Kiruna and Sodankyla at 67-69N latitudes comprises a fairly powerful platform to study large-scale atmospheric waves as tides and planetary waves with emphasis on the latitudinal signature and dynamical coupling through mesosphere and thermosphere regions. Other smaller-scale radars as MST, MF, meteor and HF radars and ground-based optical instruments as the all-sky imager and airglow spectrograph at various arctic locations are complementing the EISCAT radar in altitude, temporal and global coverage and are

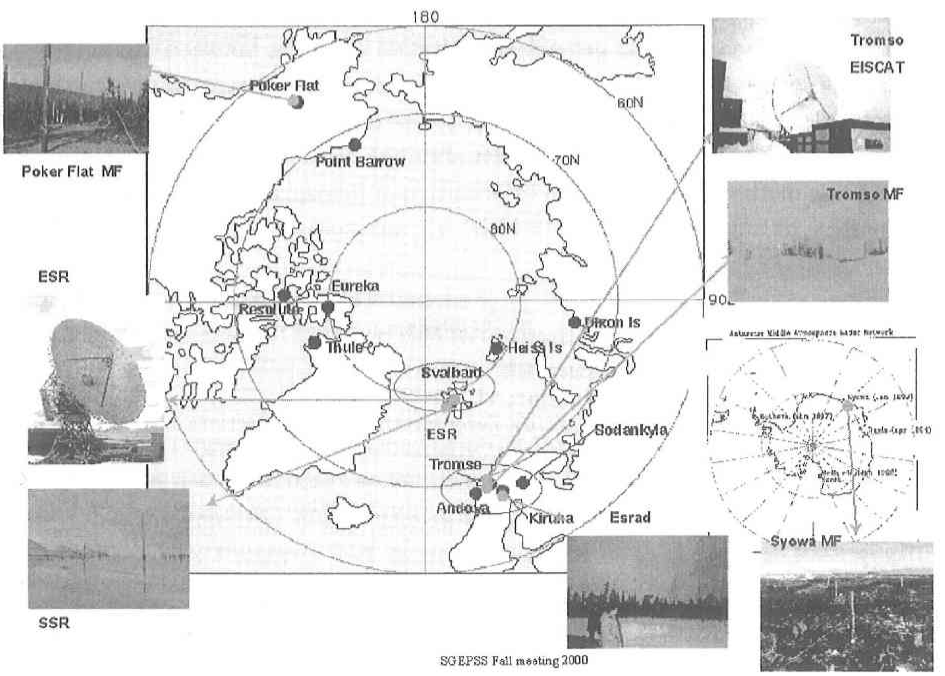

Fig. 1. Radars & optics in the Arctic region

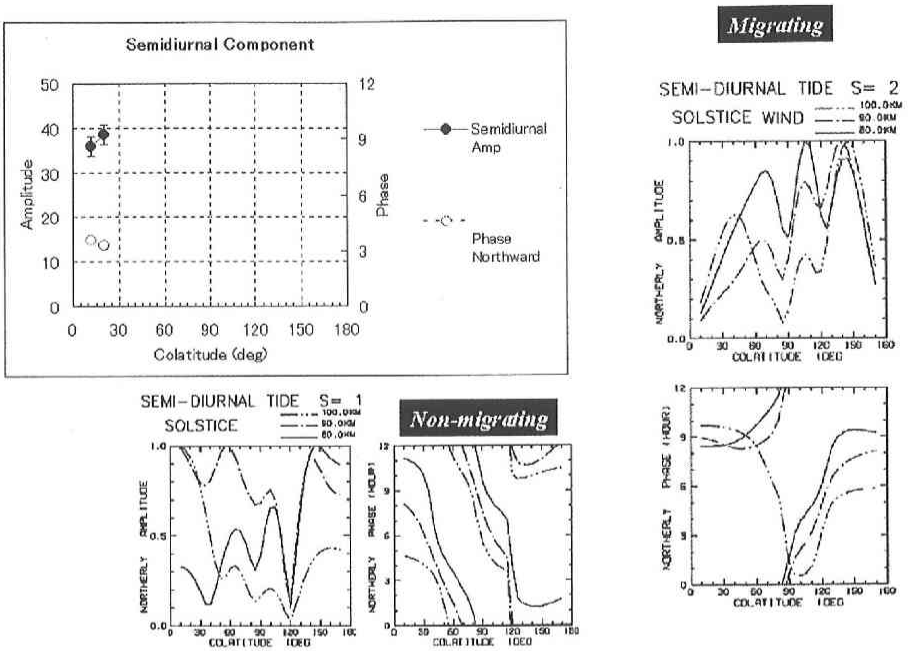

Fig. 2. Latitudinal comparison of Tromso and ESR radar in view of migrating and non-migrating semidiurnal tide.

closely collaborating to the common goal of delineating the behaviors and climatic change of the polar atmospheric dynamics. Conjugate study by the Antarctic observations and conjunction with satellites as the planned TIMED spacecraft are of vital importance as well. A brief overview on what have been clarified and what are to be studied as to the large-scale atmospheric waves in the Arctic middle and upper atmosphere by the EISCAT radar and associated observations are given in this talk.

Figure 1 shows the radars and optics in the Arctic and Antarctic regions which will hopefully be working together on the global study of large-scale atmospheric waves at polar latitudes. The network includes EISCAT radar system, SOUSY radar, Tromso, Poker Flat and Syowa MF radars and also our planned meteor radar at Longyearbyen and Dixon Island. In Figure 2 is exemplified a latitudinal plot of semidiurnal northward wind component at 100 km observed by Tromso and ESR radars in the long tide/AGW run in July, 1999 (left top) in comparison with migrating (right) and non-migrating (left bottom) tidal model for the semidiurnal northerly component. A migrating tide shows a decrease in amplitude at higher latitudes, whereas a non-migrating tide at 100 km (dashed-double dotted line) shows an increase with a rather rapid phase excursion with respect to the latitude. The present result of amplitude and phase seems to correspond more to the migrating tide, but it is not conclusive in any means. In view of summertime prevalence of zonal wavenumber one semidiurnal tide observed at the South Pole, it is of great interest at which latitude this switchover takes place in the Arctic region. These and other unsolved problems on the large-scale atmospheric waves in the polar mesosphere and lower thermosphere are to be pursued by the intensive collaboration of the EISCAT and associated polar network shown in the above figure.