Millimeter-radio, SOHO/EIT 171Å features and the polar faculae in the polar zones of the Sun.

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In this work we study different manifestations of activity in polar zones of the Sun in order to gain understanding on the phenomenon of enhanced radio temperature regions (ETR) at high solar latitudes. We have obtained simultaneous radio and optical data during 9 days in 1997. The radio data from the Metsahovi radio telescope, Finland, consisted of the 72 GHz and 87 GHz solar maps. White light observations at the Kislovodsk solar station in Russia were used to measure the coordinates of polar faculae groups and diffuse bright structures. We also compared our data with the 171Å EUV SOHO/EIT images for the same time periods.

We find the ETRs in general coincide with the relatively dark areas seen in the SOHO/EIT images. Bright structures in the SOHO/EIT maps are, in general, encircled by the polar faculae groups and diffuse bright structures visible in the white light. Many, if not all, of EUV bright structures appear to be the bases of solar plumes. Connections between ETRs and polar faculae are complicated; sometimes polar faculae groups and diffuse bright structures are situated around the ETR maxima or at their borders, sometimes we see the polar faculae groups distributed over the whole ETR area. Some faint ETRs appear to have no associated with polar faculae. However, in general there is a correlation between the ETRs, the polar faculae groups, and the plumes (bright structures), indicating that they are different manifestations of the same underlying activity. It is possible that magnetic loops in the active areas, traced by the polar faculae, are responsible for the observed radio enhancements.