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SURFACE WIND FIELD OVER THE ANTARCTIC ICE SHEET MAPPED FROM SATELLITE THERMAL INFRARED IMAGES

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Thermal infrared images of the cloud-free surface of the Antarctic ice sheet exhibit subtle stream-like features that can be traced over hundreds of kilometres. The stream features are superimposed on other features in the temperature field related to the surface topography of the ice sheet. These stream features represent a subtle modulation of the thermal structure in the atmospheric boundary layer as observed at the satellite, and are related to the density and thickness of the drift snow layer. In this work, we have mapped these features in images acquired by the ATSR instruments on ERS-1 and ERS-2 satellites. Comparison of the directions of the features with wind data from Automatic Weather stations [AWS] deployed on the ice sheet surface shows that the features give local direction of the surface wind field. Thus each image presents an instantaneous view of the wind pattern at time of acquisition. By compiling this data from many images we have produced a composite map of the surface wind field, and a record of its temporal variability over several seasons. We find a systematic change in direction between seasons which reflects the changes as observed at the AWSs.