AN INTERFERENCE MITIGATION TECHNIQUE FOR PASSIVE REMOTE SENSING OF SOIL MOISTURE

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As the cost of microwave hardware declines, an increasing amount of microwave communication equipment is in use on a global scale. As a result, interference from anthropogenic emissions has begun to noticeably influence the accuracy of passive remote sensing of soil moisture using C-band radiometry. Interference has been observed in both the NOAA Environmental Technology Laboratorys (ETL) PSR/CX airborne imaging instrument, as well as the JAXA AMSR-E instrument on the NASA EOS Aqua satellite. Both the PSR/CX and AMSR-E instruments detect C-band emissions at fixed frequencies of approximately 200 to 300 MHz bandwidth. Simultaneous observations using multiple subbands, incorporated into the PSR/CX instrument, have provided one means of interference mitigation that is useful under moderately contaminated conditions. To extend the mitigation capabilities of PSR/CX, ETL has developed a C-band spectrometer for use within the PSR/CX instrument. The spectrometer observes emissions within relatively narrower bandwidths of 10 and 100 MHz, and is tunable from 5.8 to 7.5 GHz. Because anthropogenic emissions currently have relatively narrow bandwidths, the ETL spectrometer is capable of accurately sampling microwave emission within any 10 or 100 MHz band that is found to be free of such interference, thereby reducing the interference at the expense of radiance sensitivity, and (because the instrument has to be tuned) at the expense of observation time. This paper will discuss the design and anticipated modes of operation for the spectrometer, the results of its use in the Department of Agricultures SMEX-04 experiment, and its potential for use in future airborne and satellite programs.

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