Radio Frequency Interference and the SMAP Radiometer: Risk Assessment and Reduction

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Achieving the soil moisture retrieval goals set for the SMAP mission [1]-[2] requires avoiding any significant degradations of SMAP's L-band radiometer observations. Radio Frequency Interference (RFI) is an important risk factor, even given the "protected" status of the 1400-1427 MHz band within which the radiometer operates. RFI forecasts based on known radar sources were used in initial planning studies [3], but such studies neglect any other potential source of interference. Although L-band RFI effects have been observed in numerous previous ground- and air-based campaigns [3]-[5], the majority of the observed RFI information available was anecdotal and insufficient for performing a risk assessment over large spatial scales. Recent airborne campaigns in support of SMOS [6] and SMAP [7]-[10] however have provided more detailed RFI characterizations for RFI risk assessment. Information on the RFI levels observed by SMOS is also of great interest, and will be incorporated as it becomes available.

This presentation provides an overview and status update for SMAP radiometer RFI risk reduction activities. Definitions of RFI induced errors and data omission effects are first provided, and the overall radiometer system error budget and mission requirements are used to estimate tolerable values for these quantities. Airborne RFI campaign information is reviewed, along with methods for extending these observations to assess the SMAP impact. A comparison of observed RFI impacts with those allowable is then performed to show that the baseline radiometer system would experience measurement degradation due to RFI.

Methods for reducing the RFI impact are then described and assessed using observed RFI information in conjunction with models of performance for a variety of detection and mitigation strategies [11]-[15]. Results from these studies are used to motivate a modified

SMAP radiometer design that will be reviewed in the presentation. An update of planned activities for continued risk reduction will also be described.

References

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