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TITLE: Measuring Vertical Rainfall Velocity through Spaceborne Doppler Radar: performance analysis and system requirements.

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PRESENTATION: Oral Presentation

ABSTRACT TEXT:

Knowledge of the global distribution of the vertical velocity of precipitation is important in estimating latent heat fluxes, and therefore in the general study of energy transportation in the atmosphere. Such knowledge can only be acquired with the use of spaceborne Doppler precipitation radars. Although the high relative speed of the radar with respect to the rainfall particles introduces significant broadening in the Doppler spectrum, recent studies have proven that the average vertical velocity can be measured to acceptable accuracy levels by appropriate selection of radar parameters. Furthermore, methods to correct for specific errors arising from NUBF effects and pointing uncertainties have recently been developed.

In this paper we will present the results of the trade studies on the performances of a spaceborne Doppler radar with different system parameters configurations. Particular emphases will be placed on: 1) the choice of the PRF vs. antenna size ratio, 2) the choice of the observational strategy, 3) the choice of the operating frequency; and the 4) processing strategy. The results are generated from a 3D spaceborne Doppler radar simulator created using either the high resolution airborne Doppler radar rainfall datasets, or by a cloud resolving simulator. The results show that accuracies of 1 m/s or better can be achieved with the currently available technology and with careful selection the system parameters.

The research described in this paper was performed at the Jet Propulsion Laboratory, California Institute of Technology, for the TRMM and GPM Programs under contract with the National Aeronautics and Space Administration, and at the University of Firenze was through a program funded by the Italian Space Agency.

Keywords: Doppler, Spaceborne Radar, Precipitation