

Recent Developments in Active Microwave Systems at JPL

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This paper provides an overview of some of the recent developments in active microwave systems at JPL. The first section summarizes the engineering and scientific results that were obtained from the two recent flights of the Spaceborne Imaging Radar-C/X-band Synthetic Aperture Radar (SIR-C/X-SAR) on the Shuttle Endeavor. This imaging radar system represents the third in a series of shuttle-borne radars with increasing system capabilities and complexities. The presentation emphasis will be on the SIR-C system, which operates at L- and C- bands with quad-linear polarization measurement capability. It employs a phase array antenna with multiple transmit/receive modules that are distributed across the antenna aperture, which allows for graceful degradation of system performance in case of part failures. The system parameters and on-orbit performance characteristics will be described. We will also describe the data flow process and the associated data processing system. This system operated successfully in both flights and collected about 100 terabit of data. Specific examples of the applications of these data to various scientific disciplines will be discussed.

The second section of the paper describes the recent progress in the development of interferometric SAR system for high resolution digital topography mapping. The principle for such a system will be presented. Examples of such topography measurements with the NASA/JPL airborne TOPSAR system will be shown. We will show the topography measurement accuracy assessment based on comparisons with traditional topography measurements. Examples of large area mapping, which involve the mosaicking of multiple strips of interferometric SAR results, will also be shown. Recently, a differential interferometric SAR technique has also been developed to measure minute surface topography changes based on results from multiple imaging passes with near repeat ground tracks. Examples of measurements from this technique over areas with earthquakes will be shown.

The final section of the paper addresses development of meteorological radars for rain and cloud measurements. The design of an airborne rain mapping radar that was developed to support the

Tropical Rain Measuring Mission is summarized. This system operates at 14 GHz and was deployed on the NASA DC-8 during the TOGA/COARE experiment in the early part of 1993. Results of rain storm measurements from this system will be shown. In addition, the design and development of an airborne 94 GHz cloud mapping radar will be discussed. This radar is designed to study the vertical structure of clouds, especially the determination of the cloud base height. The technical design challenges for this high frequency radar system will be described.

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