



Implications of swath altimetry missions for hydrologic science and applications

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Swath altimetry, and the joint NASA-CNES Surface Water and Ocean Topography (SWOT) mission in particular, will provide surface water elevation and extent information with unprecedented accuracy and spatial resolution globally. Although some progress has been made in the application of track altimetry data (e.g., from TOPEX-Poseidon and Jason-1 and -2) to hydrological problems, SWOT will provide coverage of orders of magnitude more surface water bodies than these and other past and present missions have been able to observe. We argue that all of the implications of the data that SWOT will produce for the hydrologic science and applications communities are not yet apparent. However, the SWOT data will certainly offer groundbreaking opportunities for estimation of two key terms in the land surface water budget: surface water storage (in almost all water bodies with surface area exceeding about 1 km²) and derived discharge for many of the world's large rivers (widths greater than roughly 100-250 m). Among just a few of the science questions that the observations should allow us to address are a) what are the dynamics of floods and overbank flows in large rivers? b) what is the contribution of long-term, seasonal, and interannual storage in reservoirs, lakes, and wetlands to sea level? c) what is the magnitude of surface water storage changes at seasonal to decadal time scales and continental spatial scales relative to soil moisture and groundwater? d) what will be the implications of SWOT-based estimates of reservoir storage and storage change to the management of transboundary rivers? These likely are among just a few of the questions that SWOT will help elucidate. Others no doubt will arise from creative analyses of SWOT data in combination with data from other missions and/or in situ sources. We conclude with thoughts on a remote-sensing based strategy for provision of global observations of the land surface water cycle for hydrologic science and applications in the post-SWOT era.