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New technologies and applications for space-based oceanographic lidars.

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Oceanographic lidars from space are a promising new technology for observing the ocean for climate research. The success of the atmospheric lidar on the CALIPSO Pathfinder satellite has shown the feasibility of future space-based lidar instruments designed to measure oceanographic properties important for climate monitoring. An oceanographic lidar in space has the potential to provide an independent measure of sea surface wind speeds, relate ocean color surface properties to properties deeper in the column, assess diuranal variations of biological processes, investigate vertical profile of biomass, and quantify air-sea CO2 flux. While designed for atmospheric returns, the CALIPSO lidar data include backscatter from land and ocean surface and from beneath the ocean surface. A radiometric model describing atmospheric returns that has been validated against CALIPSO lidar performance has been extended to include ocean subsurface returns. The model output is compared with CALIOP, aircraft lidar measurements, and space-based ocean color measurements. This provides an opportunity to explore the value of space-based lidar measurements to ocean measurements and to identify the impact of laser and detector design choices on the returned lidar signal from the ocean. This presentation shows validation of the model with on-orbit data, how the model can help define instrument requirements for future active sensing missions that hope to capture both atmospheric and oceanographic properties, and some of the expected science benefits provided by oceanographic lidars in space.