

## The Mirai lidar for observation of atmospheric water vapor, clouds and aerosols over the ocean

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1. JAMSTEC, 2. mss, 3. NIES

Lidar is an active remote sensing method; Lidar transmits light pulses to a target, then measures backscattering light intensity and its traveling time. The lidar target diameter extends as small as a molecular size with an adjustment of the light wavelength. A spatially fine resolution and a continuity of the lidar data capture a complex distribution of the target. These lidar characteristics suit to monitor the major atmospheric variables: water vapor, cloud, and aerosol.

Regardless of the lidar suitability, observation platforms for atmosphere over the ocean remain extremely rare, especially if excluding ones in the coastal region and islands. Conversely, a great coverage of the ocean on the earth surface suggests extensive interaction between atmosphere and ocean. Thus, disclosure the interaction requires an observation platform over the ocean. Since ship-borne observation is one approach, we selected the R/V Mirai as a lidar observation platform.

With modifications to the ship, the Mirai lidar has successfully archived vertical distributions of the atmospheric variables over diverse waters. The continuous data illustrated temporal transitions of the variables in details. We converted the obtained data into physical parameters, such as water vapor mixing ratio. After the conversions, we evaluated the lidar data quality thru comparison to other observations conducted on the R/V Mirai.

Keywords: lidar, atmospheric observation over ocean, water vapor, cloud, aerosols, ship-borne observation