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Comparing Ship Track Droplet Sizes Inferred from Terra and Aqua MODIS Data

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The motivation of the study is to investigate cloud micro physics of ship tracks as a function of time. The paper describes how droplet effective radii retrieved from Moderate Resolution Imaging Spectroradiometer (MODIS) imagery for a selected set of ship tracks appear to grow from the beginning of the track towards the end of the track. MODIS 1 km observations of morning (Terra) and afternoon (Aqua) passes were analyzed to estimate the droplet sizes (and their changes in time) of the aerosols that formed the ship tracks. Ship tracks are the low-level anthropogenic clouds that form around the exhaust released by ships. They modify the overlying cloud albedo by having high particle concentration and small droplet size and thus can be detected from higher reflectivity in near infrared imagery, especially in 2.13 μm observations where they appear as bright features. The MODIS Cloud Product (MOD06 from Terra and MYD06 from Aqua) is used to estimate droplet size change in ship exhaust plumes with time in case studies from different parts of the northern hemisphere. Ship track pairs were chosen both in Terra and Aqua MODIS images to estimate the droplet size change from morning to afternoon. Droplet size increased with time in the atmosphere as measured by distance from the ship. Terra and Aqua MODIS droplet size estimates were in good agreement and are found to be between 6 and 17 μm with droplet size increase at an average rate between 0.5 to 1 μm per hour. Terra and Aqua MODIS results are found to be 90$\pm$8% correlated with each other. The case studies further demonstrated stability of the MOD06 algorithm.

Key words: Ship Tracks, Anthropogenic clouds, Remote sensing, MODIS, Droplet size