

3.084 Relationship between anthropic pollution in the Santiago Metropolitan Region and the decrease of snow albedo on the Maipo river basin, Chile.

Early Career Scientist

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Abstract:

The snow melting in the Maipo River basin during the austral spring is one of the main water sources for the Santiago Metropolitan Region (SMR) and the decreases of snow albedo can be an indicator of the presence of atmospheric aerosols (e.g., black carbon, organic carbon and dust). Therefore, changes in the snow albedo from the upper Maipo river basin related to the aerosol atmospheric deposition potential in the spring were analyzed. Remote sensing data of snow cover, snow albedo, aerosol optical depth (AOD) and surface temperature were obtained from the Moderate Resolution Imaging Spectroradiometer (MODIS) onboard NASA Terra satellite and precipitation from the TRMM satellite from the period 2000-2016. Only pixels with 100% snow cover were used to derive the average monthly value of the indicated data and daily for a case study. The statistical analysis showed that an average of 5% snow albedo reduction in the spring on this basin is linked to an AOD increase. However, daily data analyzed for the case study, showed that the AOD variations have a similar behavior to those reported by PM10 and PM2.5 measurements in the air quality network of this region with a maximum 0.23 AOD, 32.04 $\mu\text{g}/\text{m}^3$ PM2.5 and 61.60 $\mu\text{g}/\text{m}^3$ PM10. This may be related to an observed decrease of 30% of snow albedo. A retro-trajectory analysis using the HYSPLIT model, showed that the origin of these aerosols observed on the snow area came from the SMR. The results indicate that the anthropogenic aerosols are reaching the snowy areas, decreasing the albedo in snow and consequently increasing its rate of ablation during the spring on this area in this 16-year period.