

Board 0096: Analyzing Changing Thermal Features at Puyehue-Cordon Caulle, Chile Using Satellite, Field, and Drone Observations



Wednesday, 14 December 2022



09:00 - 12:30



McCormick Place - Poster Hall, Hall A (South, Level 3)

Abstract

The Puyehue-Cordon Caulle (PCC) volcanic complex, Chile, hosts numerous thermal features, including a ~ 0.8 km³ laccolith formed during the 2011-2012 eruption. Laccoliths are large intrusions that form between country rock layers that have been rarely observed during the process of formation. We use medium-spatial resolution (90 m/pixel) satellite data from the Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER), to identify changes at the laccolith and other thermal features within PCC between 2000 and 2022. Previous studies have analyzed thermal behavior using MODIS images, which have low spatial resolution but high temporal resolution, and Landsat images, which have medium spatial resolution, but were only examined during the eruption (2011-2012). Prior research using ASTER data have only recorded the maximum temperature at PCC, while this study analyzes all of the individual thermal features and records both temperature and area for each feature identified in all 41 cloud-free, nighttime ASTER images available over the last 22 years. We focus on changes to seven features observed by satellite with temperatures at least 2 K above background (Trahuilco, Las Sopas, Los Venados, Los Baños/El Azufra, Puyehue, Laccolith, and a new unnamed feature). We create time series for each feature in order to: (1) evaluate temporal changes in area and temperature, (2) detect significant deviations from standard seasonality in non-eruptive periods, and (3) test for statistically significant precursors to the 2011 eruption. We identify both seasonal temperature variation and a general subtle increase in temperature over time at the laccolith. Furthermore, we find growth in the area of the laccolith with temperatures above background since 2016 including two periods of sudden increase in area between 11/2017 - 9/2018 and in mid 2020. We compare the ASTER observations with higher spatial resolution observations of fissures, craters, and fumaroles identified from field observations, drone thermal and optical imagery and high spatial resolution (~ 1 m/pixel) satellite SAR and optical data. We interpret the thermal changes at the laccolith to be related to fractures and craters in the laccolith exposing hot regions.

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