

Understanding volcanic mesocyclones

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Introduction:

Large volcanic eruptions perturb atmospheric physics, chemistry and dynamics with significant implications for weather and climate from local to global scale. The ascending volcanic column generates a unique hydrodynamic effect, known as a "volcanic mesocyclone", which has not been thoroughly addressed until now. This phenomenon initiates a rotational motion within the entire plume around its axis. Due to this rotation, the plume's umbrella loses its axial symmetry, forming lobes in a pattern visible from above, as observed in many eruptions at Mounts Pinatubo, Manam, Reventador, Okmok, Chaiten, and Raikoke (Fig1). It is so far unclear which atmospheric and volcanic conditions control the generation of volcanic mesocyclone.

Research topic

What are the processes that control the formation and evolution of volcanic mesocyclones?

Working plan

- Step 1: Literature review
- Step 2: Analyzing the ERA5 data during volcanic eruptions and identification of case studies
- Step 3: Simulation of cases studies using ICON-ART
- Step 4: Validation of the results, writing of thesis

Requirements

- Motivation, self-organization and team work
- Programming: Python (basic), shell & unix (basic)

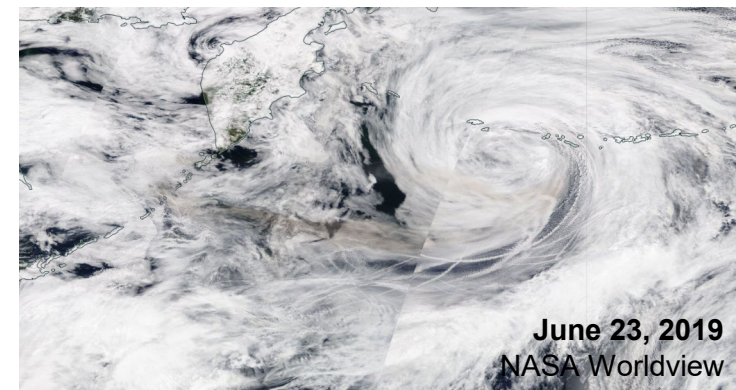


Fig 1: Rotation of the Raikoke ash plume