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Which side of the continental divide receives water from the atmosphere?

PROJECT SUMMARY

A field experiment was held in the Canadian Rockies in the spring 2019 to study storms and precipitation across the continental divide. From the field data analysis and additional datasets, it was found that the precipitation distribution across the continental divide in the southern Canadian Rockies depends on the moisture flux strength, direction, and origin as well as its condensate features.

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STORMS AND PRECIPITATION ACROSS THE CONTINENTAL DIVIDE EXPERIMENT (SPADE)

Progress

 Meteorological instruments were deployed at three experimental sites
 on both sides of the continental divide in the southern Canadian
 Rockies, from April to June 2019 Study region map showing the major river basins (red outlines) of North America with respect to the Canadian Rockies, with the blue arrows indicating the direction in which surface water flows, the study domain, and the continental divide elevation profile.

Key Results

A conceptual model was developed to summarize the conditions during which

- Atmospheric conditions, precipitation amounts, and particle types were analysed on both sides of the divide simultaneously
- Post-experiment analysis included:
 - Investigation of the precipitation gradients over the Canadian Rockies
 - Study of the wind flow pattern prior to precipitation events in the Kananaskis Valley, on the eastern side of the continental divide
 - Analysis of the microphysics of precipitation during precipitation events crossing and not crossing the continental divide





SPADE participants conducted outreach activities during SPADE with 6th graders at a middle school in Canmore, AB.





precipitation crossed and did not cross the continental divide:





User Engagement

 PI and co-PI met with government departments to discuss water
 related issues in 2019, 2020 and
 2022. (b) and (c) are schematic diagrams of the atmospheric conditions and precipitation characteristics when precipitation crossed the divide and when the precipitation did not cross the divide, respectively. (b) The warmer cloud contains liquid droplets and ice particles and (c) the colder cloud mainly consists of ice crystals. The direction of propagation of the cloud and precipitation is shown. The cloud droplets and raindrops are smaller and larger blue circles, respectively.

(a,b,c) The two meteorological stations deployed east of the continental divide at Fortress Powerline and Fortress Junction, and one deployed on the western side at Nipika Mountain resort. (d) A photo of SPADE participants at the continental divide during a sunny day.

- The project plan, progress, and
 outcomes were shared with the
 staff and management of Nipika
 Mountain Resort
- SPADE participants conducted

 outreach activities in Canmore, AB,
 with school groups and local
 community organisations

Outcomes and application uptake

- Database available on the Federated Research Data Repository
- Conceptual model of on the atmospheric processes leading to precipitation crossing or not the continental divide
- New hypothesis on how the water distribution could evolve in warmer climatic conditions









