# Storms and Precipitation Across the continental Divide Experiment SPADE

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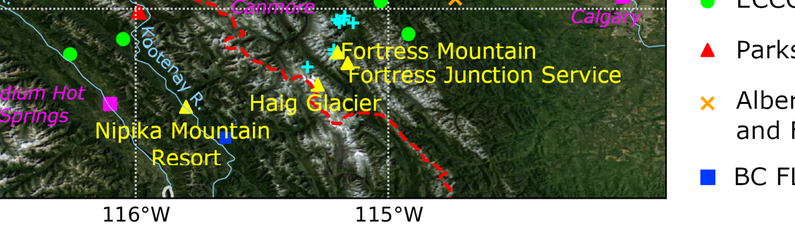
## Background

- Storms and their precipitation at the top of the Canadian Rocky Mountains are some of the key water-related issues in North America.
- Related to the amount of moisture flux crossing the continental divide
- Moisture flux can come from either the Pacific in eastward moving storms or from the Prairies and Gulf of Mexico in leeside storms

## Objectives and science questions

To investigate small-scale processes leading to orographic precipitation passing over the continental divide. In particular,

- How much condensate is passing over the divide and falling to the surface on the upwind and downwind slopes?
- What are the factors governing this condensate and the surface distribution of precipitation?
- How well are these features of the precipitation simulated?




## Approach

Focus on 2 study locations on both sides of the continental divide:

1. Nipika Mountain Resort (BC)
2. Fortress area (AB): Site A: Fortress Mountain Site B: Fortress Junction Services

**Area of interest**




**Numerical simulations**

- Atmospheric model (Global Environmental Multiscale, GEM) to study the weather conditions and precipitation trajectories across the continental divide
- Computational fluid dynamics (CFD) to address the precipitation distribution near the surface

**Field measurements**

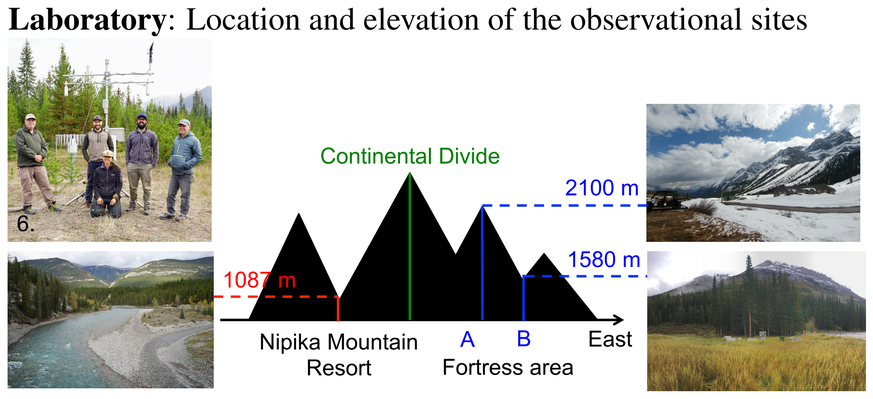
- Conduct a field experiment across the continental divide during May-June 2019
- Measurements of precipitation intensity[1,3] and types[2,4,5] as well as atmospheric conditions at the surface and aloft[3,5,6]




1: Weighing gauge 2: Optical disdrometer 3: Micro Rain Radar 4: Microphotography 5: Car-sonde

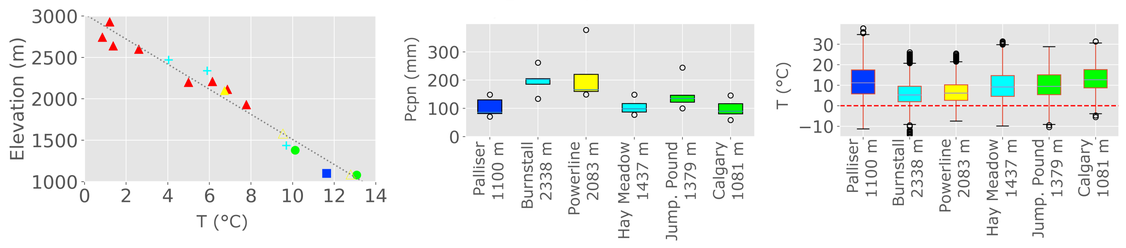
## Progress and preliminary analysis

**SPADE Laboratory**: Location and elevation of the observational sites




**Climatology: Temperature (T) and precipitation (Pcpn)**

- Used a subset of stations on the map [May-June 2014-2018]




- $\frac{dT}{dz}$ rate ~6.6°C/ km and $T_{mean}$ Nipika and Fortress Site B are inferred from that lapse
- Monthly pcpn is higher near the divide and decreases on both sides
- Large temporal variation of T (up to 20°C) and T is mainly >0°C

## Summary

- The field project planning is well on track and the simulations have started
- All the instrumentation will be installed by the end of April 2019
- Precipitation events should occur during May-June 2019, with variable types of precipitation → the height of the 0°C isotherm ∼ 3 km

Overall, SPADE will contribute to increase our knowledge on precipitation processes and how precipitation sustains local features such as glaciers and runoff generation in headwater river basins of the Canadian Rockies.

## Broader context

- Contribute to the **the following GWF overarching goals**: to improve disaster warning such as through flood mitigation/prevention, and to predict water futures.
- Contribute to the **UN sustainable Development Goal #6**:
  1. To implement integrated water resources management at all levels, including through transboundary cooperation as appropriate.
     → SPADE could assist scientists and policy makers in water management decision making by improving understanding precipitation processes that span across both BC and AB.
  2. To support and strengthen the participation of local communities in improving water and sanitation management.
     → SPADE will be involved in community outreach by engaging youth about topics related to water management.

## People involved and funding sources

**Project Manager**: Juris Almonte **Collaborators**: David Hudak, Zen Mariani, Mike Hardwood and Jason Milbrandt (ECCC); Vincent Vionnet (GWF Core); Maud Leriche (UQAM/CNRS); Shawn Marshall (U of C) **Students**: UQAM: Cécile Carton (PhD), Aurélie D.-Lapointe (MSc) and Charlie H.-Pinard (UG); UNBC: Selina Mitchell (MSc) and Jeremy Morris (MSc); U of S: Andre Bertoncini (PhD)

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