

Snow Parameter Estimation with a GNSS receiver and a Virtual Reference Station

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Schweizerische Eidgenossenschaft
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Confederazione Svizzera
Confederaziun svizra

GNSS-based SWE monitoring stations



Hydro Québec, Millertown,
Newfoundland, Canada

SWE measurement station,
Laret, SLF

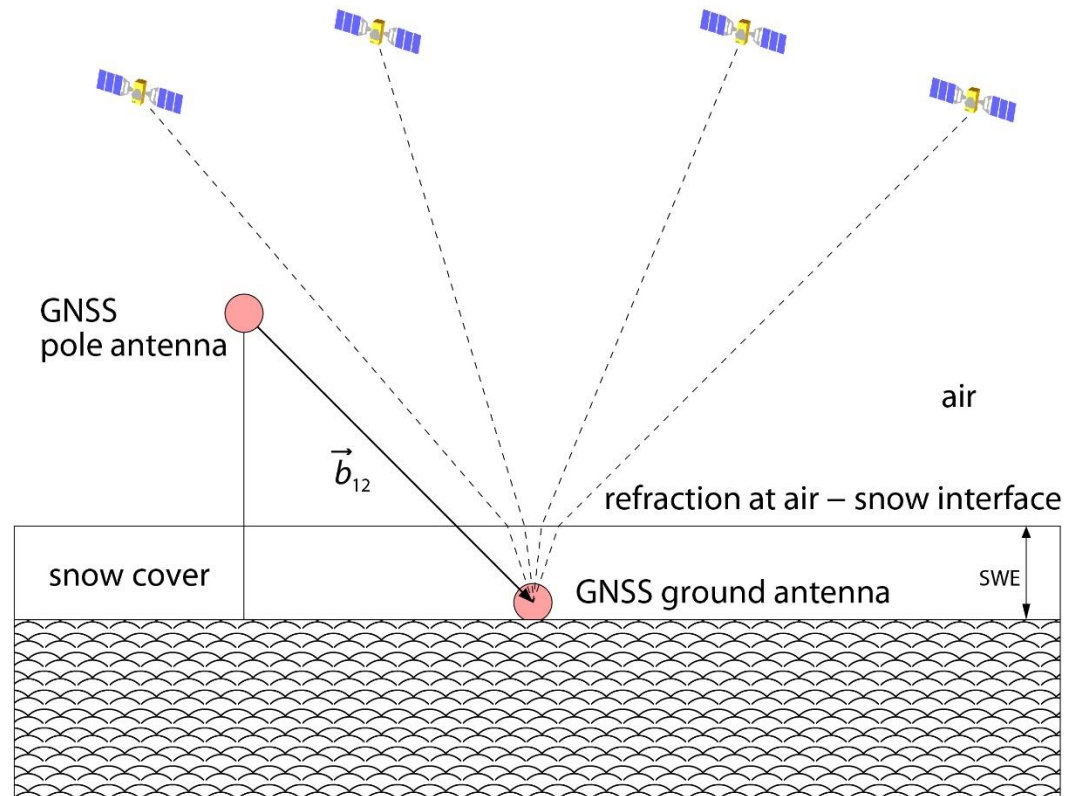


GNSS-based SWE monitoring stations

Why 2 GNSS receivers?

- Elimination of atmospheric errors (tropospheric, ionospheric delays)
- Elimination of satellite orbit and clock errors
- Elimination of satellite phase and code biases

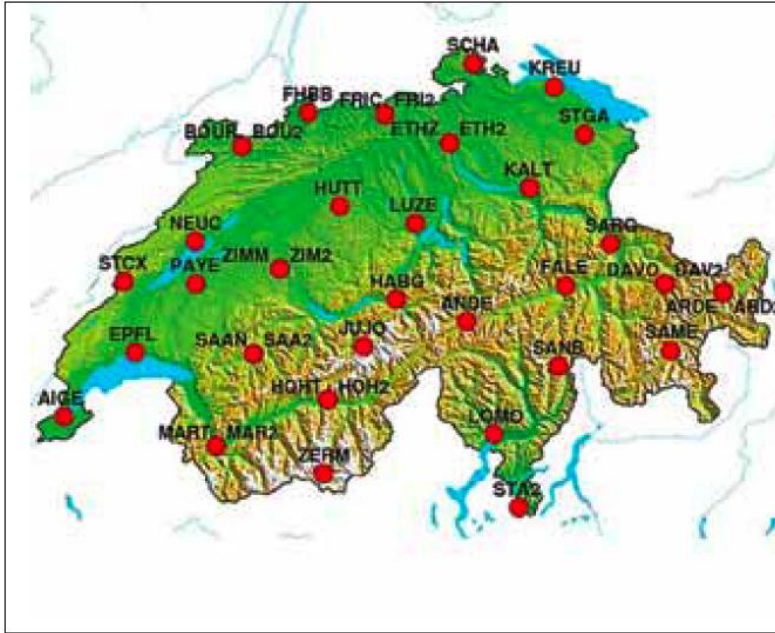
Effect of snow is still kept in differential measurements.



Methodology for Snow Parameter Estimation with Virtual Reference Station

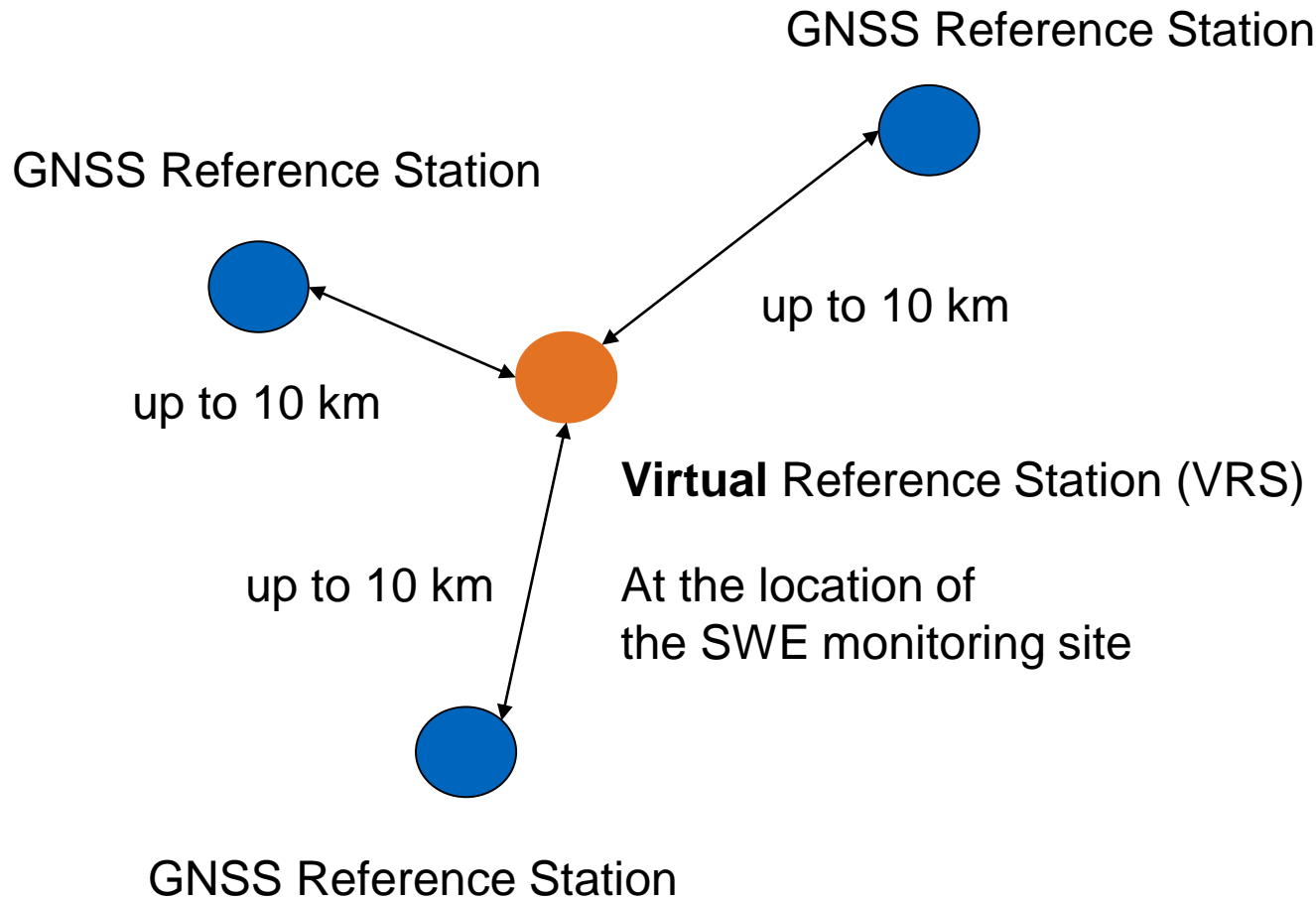
1. Determination of rough estimate of location of snow monitoring site location with GNSS pseudoranges
2. Transmission of rough estimate of location to VRS service provider (e.g. SwissTopo)
3. Determination of Virtual measurements for rough estimate of location by VRS service provider
4. Transmission for Virtual measurements to snow monitoring site (e.g. through internet link)
5. Differential RTK positioning and snow parameter determination using both real and virtual measurements of snow monitoring site

GNSS reference station network of SwissTopo



Site at DAVOS

Concept of Virtual Reference Stations



Advantages of Snow Parameter Estimation with a Single GNSS receiver and a Virtual Reference Station

- ① Less power consumption
- ② Lower costs
- ③ Easier installation