

Location

The NB Power Mactaquac Generating Station, Keswick Ridge, New Brunswick, Canada.

Purpose

Detection of mm level displacements of the main intake and the diversion.

Configuration

2 reference GS100s, 4 monitored GS100s, and 1 PS100. Stations connected using local WiFi network.

Details

Swelling of concrete due to Alkaline Aggregate Reaction (AAR) and thermal effects cause the main intake and diversion structures to move several mm over the course of a year. GPS has been implemented to complement existing instrumentation for monitoring structural deformation. The main challenge at this site from a Global Navigation Satellite System (GNSS) standpoint is obstruction of satellite observations due to surrounding infrastructure.



mmVu™ GNSS Monitoring Systems network with communications infrastructure at the Mactaquac dam.

Traditional Instrumentation

In the early 1980s, instrumentation was installed in the powerhouse and the water retaining structures to measure the effects of the openings and cracking. Instrumentation included borehole extensometers, tape extensometers, plumbines, inverted pendulums, 4-pin gauges, strain gauges, stress cells and joint meters. One of the challenges of using these technologies is that they require an intimate knowledge of geological conditions of the area. Additionally, many of these sensors require manual readings, which is time consuming and not effective for signalling sudden changes. Because of the limited number of samples over the course of a year,

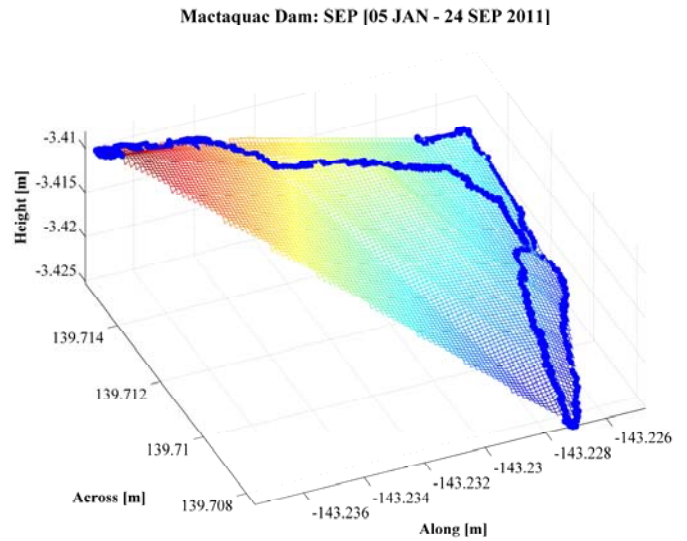
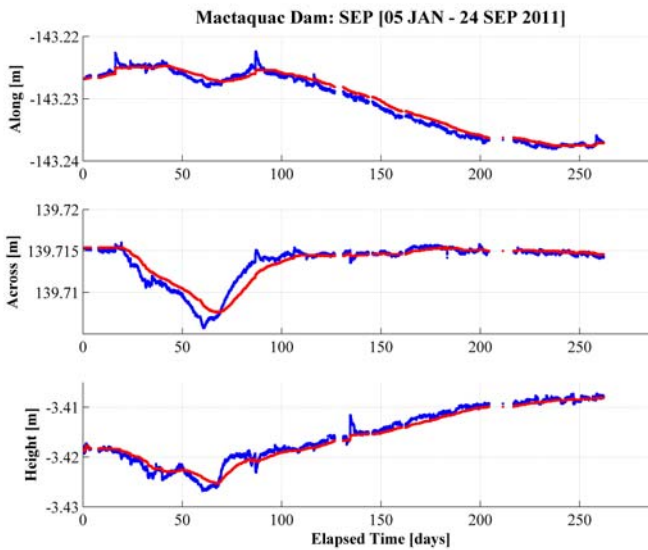
anomalies in annual trends may not be detected and peak values may be missed.

mmVu™ Advantages

Because mmVu™ uses GNSS based sensors, it is able to use reference measurements from the deformation-free zone. This eliminates the need for previous knowledge of the underlying geological conditions. Additionally, expensive drilling costs can be avoided when trying to reach stable ground for reference points for tilt sensing systems. mmVu™ provides continuous positioning updates in real-time, allowing for a more complete picture of deformation phenomenon to be obtained.



Left: A GS100 antenna mounted on the face of the Diversion. **Centre:** A GS100 located on the Main Intake. **Right:** GS100 located in a stable area with good satellite visibility.



Left: Station 100 to Station 4 (SEP) baseline solution components. **Right:** 3D path of Station 4 GPS antenna.

