

## SOLAR SPECTRAL NETWORK (SSN) IN ARMENIA AND CANADA BASED ON SEMS-2000/3000

In recent years **GEONICA** has supplied measurement stations for the Evaluation of the Solar Resource in National Networks of Armenia and Canada, with the particularity that includes measurement of solar radiation resolved spectrally. These networks are based on our **SEMS-2000/3000** system, which together with the measurement of global solar radiation incorporates its own solar tracker design, the **SunTracker-2000/3000** that enables measurement of both diffuse and direct solar radiation.

The spectral measurement is based on the integration with **SEMS-2000/3000** system of the **GEO-SolarSIM-D2**, a spectrally-solved solar radiation measurement sensor. The **GEO-SolarSIM-D2** is a revolutionary new approach to solar and atmospheric measurement, using simple rugged hardware and innovative software to drastically reduce the cost of direct solar spectrum measurement, Aerosol Optical Depth, Water Vapor content and Ozone level in a compact, energy-saving device.

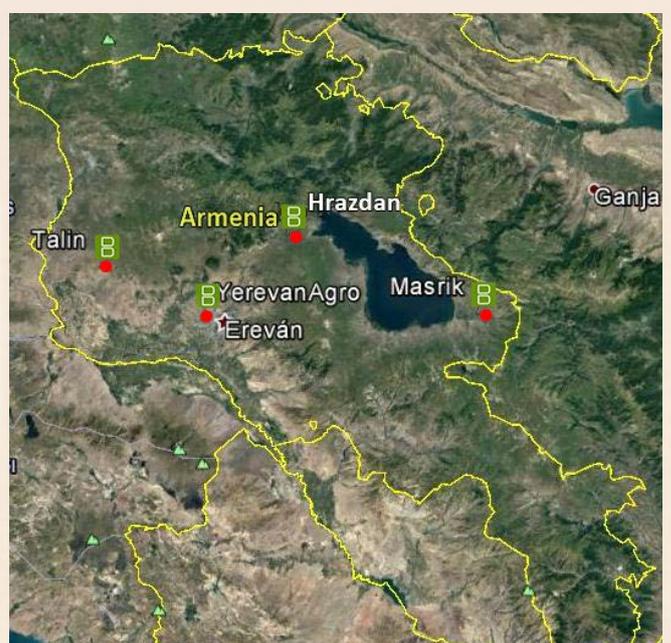
In this way, **SEMS-2000/3000** System has been designed by **GEONICA** for measurement and transmission of real-time data on all components of solar irradiance, as well as all the necessary meteorological parameters, making it even more interesting to setup National Networks for the Evaluation of Solar Resources.

### Armenia

The project was funded by the World Bank Group, and developed in a consortium of companies promoted by the Energy Efficiency Fund and Armenia Renewable Resources to improve knowledge of the national solar resource in 2016. This network is initially composed of four stations located in Hrazdan, Masrik, Yerevan and Talin, with the intention of expanding it in the future. It is especially relevant that all the stations are located at an altitude between 1000 m and 2000 m since Armenia is a very mountainous country.



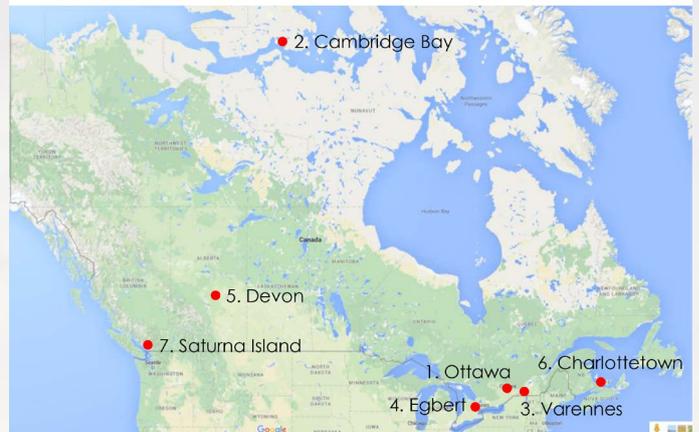
The four stations are based on a **SEMS-3000** with a complete set of meteorological and solar sensors, including the **GEO-SolarSIM-D2**. In addition to Ethernet communications, the station has a 3G/GPRS modem that allows monitoring and downloading of data over the local cellular network.



## Canada

The Canadian Solar Spectral Irradiance Meter (CanSIM) network promoted by the Natural Resources Canada (NRC, Government of Canada), consists of seven stations in six provinces located in Ottawa and Egbert in Ontario (ON), Varennes in Quebec (QC), Charlottetown in Prince Edward Island (PE), Devon in Alberta (AB), Saturn Island in British Columbia (BC) and Cambridge Bay in Nunavut (UN). The last unit was commissioned in summer 2017.

## CanSIM Network Site Locations



The typical CanSIM station consists of a **SEMS-2000** system with a **SUN SENSOR** (for active tracking) containing a **GEO-SolarSIM-D2** and a **GEO-SolarSIM-G** for the measurement of direct and global solar irradiance respectively resolved spectrally, together with a **GEO-SR20** Secondary Standard pyranometer. Data is recorded at one-minute intervals by **METEODATA 3000** datalogger/controller and transmitted remotely to a central server for storage and analysis.

The CanSIM station provides a wealth of atmospheric and solar data, including ambient temperature, pressure and humidity, DNI and GHI, spectral DNI, GHI and AOD in the range 280-4000 nm, total atmospheric column ozone and precipitable water vapor content. In addition, the total horizontal diffuse spectral irradiance (DHI) and total DHI can be easily calculated from spectral DNI and GHI, as derived from **GEO-SolarSIM-D2** and **GEO-SolarSIM-G** respectively.

