

The Current Configuration of an Automated Cleaning System Coupled With Modified Ventilation Design at the Kwajalein Baseline Surface Radiation Network (BSRN) Site in the Republic of the Marshall Islands

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Broadband shortwave and longwave surface radiation measurements were initiated at the weather station located on Kwajalein atoll in 1989. The site was modified in April 1996 and became one of the NOAA ESRL BSRN sites. Modifications included installation of an automated solar tracker configured for solar direct beam, diffuse sky shortwave and downwelling longwave radiation measurement using a shaded pyranometer and shaded pyrgeometer plus meteorological measurements of temperature, humidity, windspeed and direction plus pressure. The current installation consists of redundant measurements of direct beam, diffuse sky irradiance plus total solar irradiance (unshaded pyranometer), optical depth using a four channel sun photometer. The site is located on the roof of a building and is continuously exposed to surf zone air containing fine sea salt laden water droplets which fog over the optical surfaces of solar sensors. In spite of the frequent rain showers which flush the sensor windows, the clear periods with no showers pose the most challenging measurement environment since a typical daily cleaning by station personnel is not adequate to keep the sensors acceptably clean for the whole day. Multiple daily cleanings under persistent clear conditions proved necessary to avoid measurement degradation due to salt spray fogged sensor optics. In 2004 an initial version of an automated washing system and modified ventilation system was installed and activated as needed via modified data logger software. This poster describes the current configuration and design of the automated system as it has evolved over the past five years. The basic components (air blowers and washing fluid pump) of the system have proved reliable but the maritime tropical environment of Kwajalein has been challenging for plumbing components used for water and ventilation. Currently, the most sustainable system design to date is described but still requires refurbishment and replacement every twelve to eighteen months due to material degradation in the Kwajalein environment.



Figure 1. A view of the sensor wash cycle in operation at the Kwajalein BSRN site. The sensor domes are sprayed with water obtained from a fresh water line inside the building on which the tracker is mounted. Each cycle lasts about 15 seconds and is turned on and off via software in the data logger program. The sensors are ventilated using conditioned air pumped continuously by regenerative blowers located inside the building. Two blowers are used to add redundancy.