PRISM SNOTEL QC System

Overview

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This document provides a brief overview of the PRISM SNOTEL QC project, how the QC system operates, and outlines the output data provided to NRCS.

Purpose

The purpose of this project is to develop and implement a PRISM SNOTEL QC system that applies quality control measures to SNOTEL data, produces quality flags, and estimates a replacement value for each observation. QC measures include general range checks, station profile checks, spatial QC, and multi-sensor QC. The system is active for all SNOTEL stations, and most SNOLITE stations, within the western conterminous US.

For SNOTEL stations, QC'ed elements include daily minimum and maximum temperature, precipitation, and snow water equivalent; snow depth has also been included as an ancillary variable. For most SNOLITE stations, QC'ed elements are limited to daily minimum and maximum temperature.

As outlined in the original scope of work, the QC system was designed to adhere to the following guidelines:

- Emphasis is on "first look" operational usage, not historical data assessment
- Emphasis is on a functioning system, rather than trying to be the "be-all" of QC systems

First look QC results, based on original data, are typically available within 36 hours of the end of a measurement day. Only a fraction of the weather data from other networks is available within a one or two-day time frame, so the first look results must be considered early and tentative. The original scope of work did not envision updates to the first look results. Since then, however, the PRISM Climate Group has been working to make updates possible. As a result, it is anticipated that several update cycles will be made out to six months after the measurement day.

Important Note: PRISM SNOTEL QC results are not intended to preclude edits made by NRCS Data Collection Offices.

Climate Elements

QC output elements provided to NRCS are as follows:

- Daily incremental precipitation (PRCP)
- Daily maximum temperature (TMAX)
- Daily minimum temperature (TMIN)
- Accumulated snow water equivalent (WTEQ)
- Accumulated snow depth (SNWD)

Notes:

1. SNWD was not a stated deliverable for this project; however, because it was used in some internal QC calculations, it was added as an ancillary element.
2. While the output WTEQ and SNWD provided to NRCS are accumulations, it is the daily *incremental changes* in these elements that are QC'ed, not the accumulations themselves.

QC Components and Operational Process Flow

In operation, the PRISM SNOTEL QC system evaluates the previous day's unedited ("original") data within 36 hours of measurement. The system is comprised of four main components, operated in the following sequence: SSQC, PROF, SPQC, and MSQC (Figure 1). These components are designed to address different QC aspects, and sometimes different variables. SSQC (single-station QC) does basic range and flat-line (repeating value) checks on all variables. PROF (profile QC) uses station-specific curves of extreme values to estimate the limits of acceptable values for all variables. SPQC (Spatial QC) uses PRISM to check for spatial consistency of TMAX, TMIN, and PRCP with other stations as they are mapped each day, and provides estimates for values deemed bad or missing. WTEQ and SNWD are not mapped by PRISM, so MSQC (multi-sensor QC) uses multiple sensor relationships at a single station, with QC'ed temperature and precipitation as inputs, to check and estimate daily changes in WTEQ and SNWD values and provide estimates for values deemed bad or missing.

QC results are subsequently updated several times, approximately five days, and one, two, three, four, five, and six months after the day has ended. Updated QC results are based on versions of the data that are current at the time.

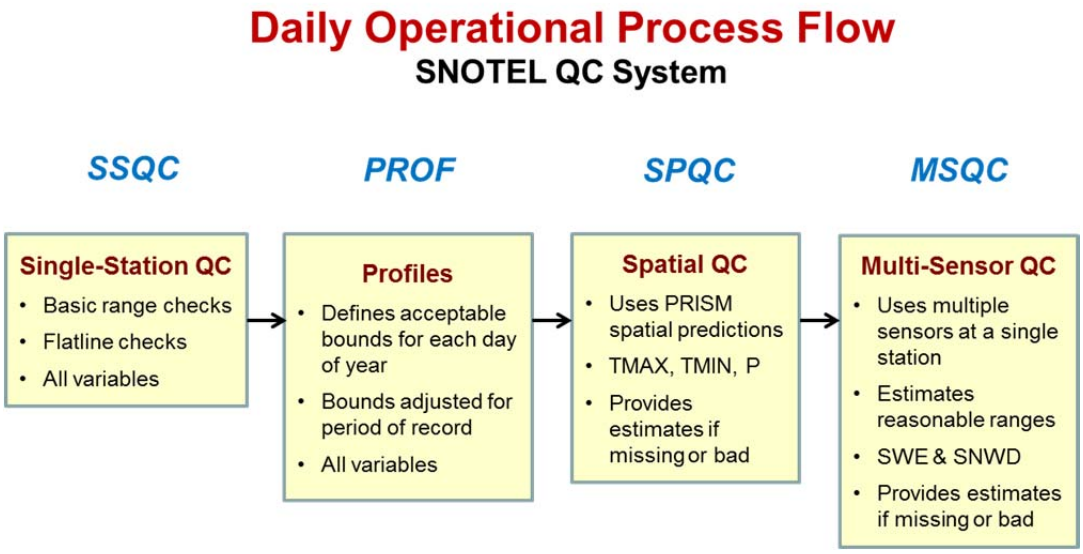

Figure 1. Sequence of PRISM SNOTEL QC components.

Output Data Fields

Below are the output data fields NRCS can access from the PRISM SNOTEL QC website. These fields are available via downloadable CSV files, or in a more user-friendly form through a map server interface. For each element, the actual observation and a suggested replacement observation are provided. If an observed element passes all tests, the QC status flag is set to TRUE. If an observed element fails a QC component, the overall QC flag is set to FALSE, and the component and test flags set to provide details about the failure. Each observation is evaluated by each QC component in the sequence shown in the flow chart in Figure 1. The system stops as soon as an observation fails a test within a component. If, for example, an observation fails a test within the PROF component, a flag indicating the test failed within PROF is set, and no subsequent QC components are invoked. For each station and each element, daily QC fields are as follows:

- Element name (PRCP, TMAX, TMIN, WTEQ, SNWD)
- Observation
- Suggested replacement observation
- QC status flag: Overall QC status of observation (TRUE, FALSE, NULL)
- Component flag: QC component failed (SSQC, PROF, SPQC, MSQC, NULL)
- Test flag: Test that was not passed within the failed component (<string>, NULL)