

Analysis of Environmental Sensor Station Networks

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Outline

- Draft report analyses aspects of
 - *Clarus* System
 - Meteorological Assimilation Data Ingest System (MADIS)
 - Road Weather Information Network (RWIN)
- USDOT interested in possible improvements for *Clarus* and issues affecting its transition to MADIS.
- Goals:
 - Look for the best features of *Clarus*
 - Look for areas where *Clarus* could be improved
 - Look for unique features in *Clarus vs* MADIS vs RWIN

Noblis report in response to FHWA Road Weather Management Program task

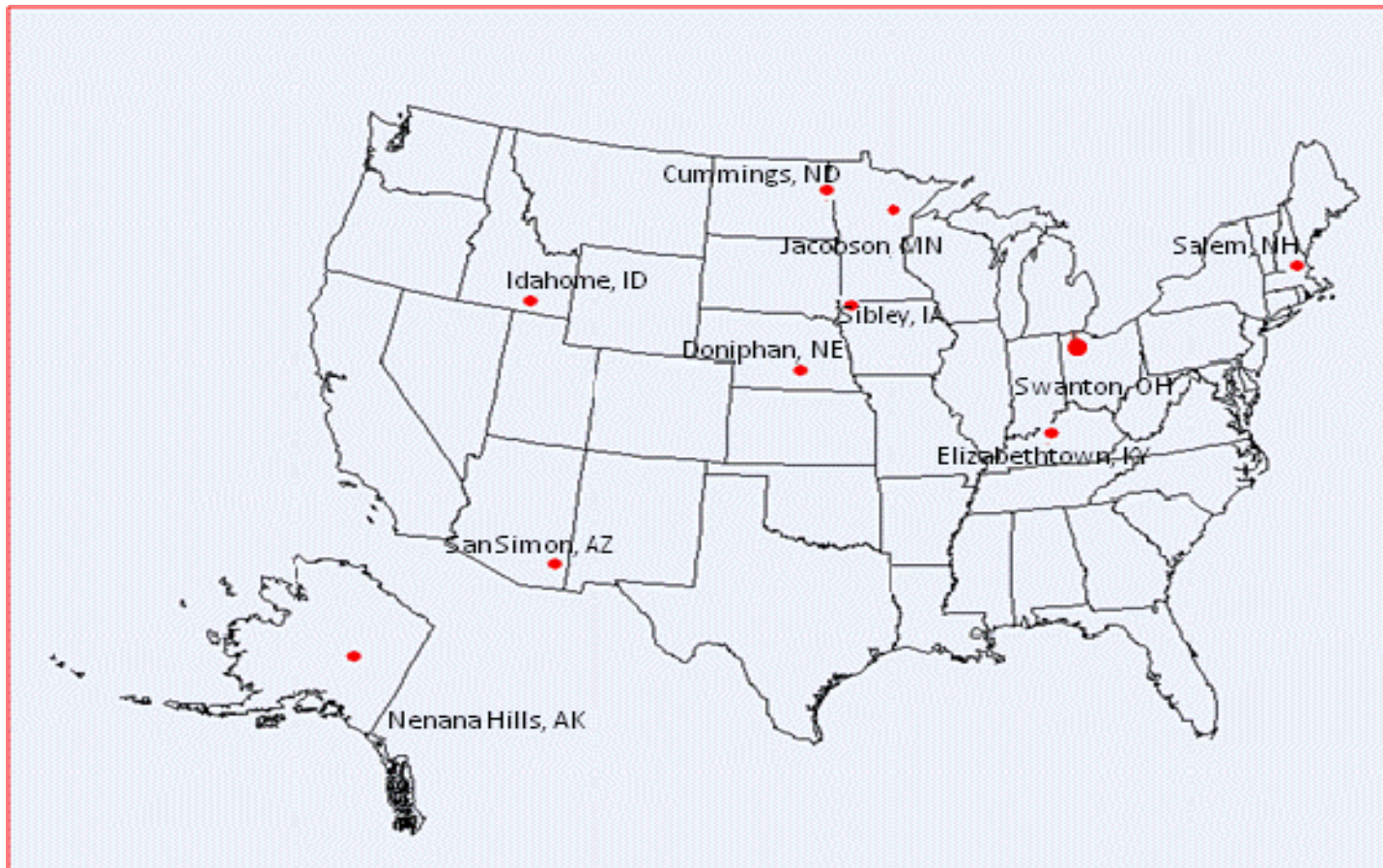


Focus on 3 Networks

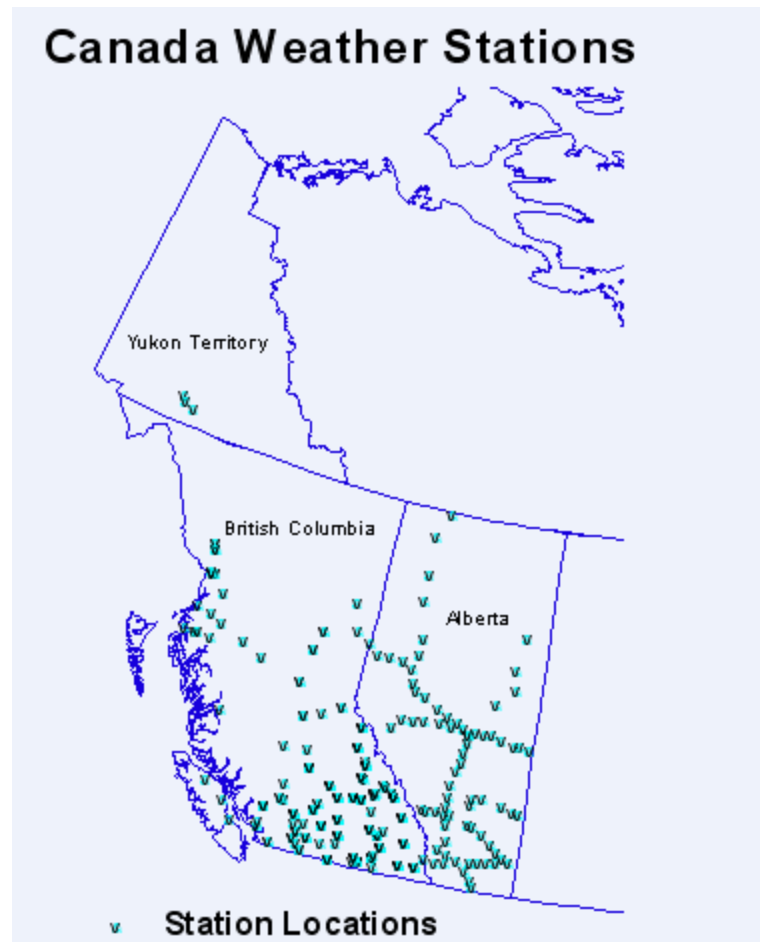
- *Clarus*: operated by Mixon/Hill, Inc. and collects ESS data from State, municipal, and Provincial transportation agencies.
- MADIS: operated by NOAA through the Earth System Research Lab and performs data collection from ESS and many other sources via direct communications to State DOT servers and other data aggregators such as MESO West.
- RWIN: operated by Environmental Canada and obtains ESS data from Provincial transportation agencies. A contractor, Telvent, collects observations from stations.



Ten Stations Selected Reporting both to MADIS and *Clarus*



Canadian RWIN Stations also Reporting to *Clarus*

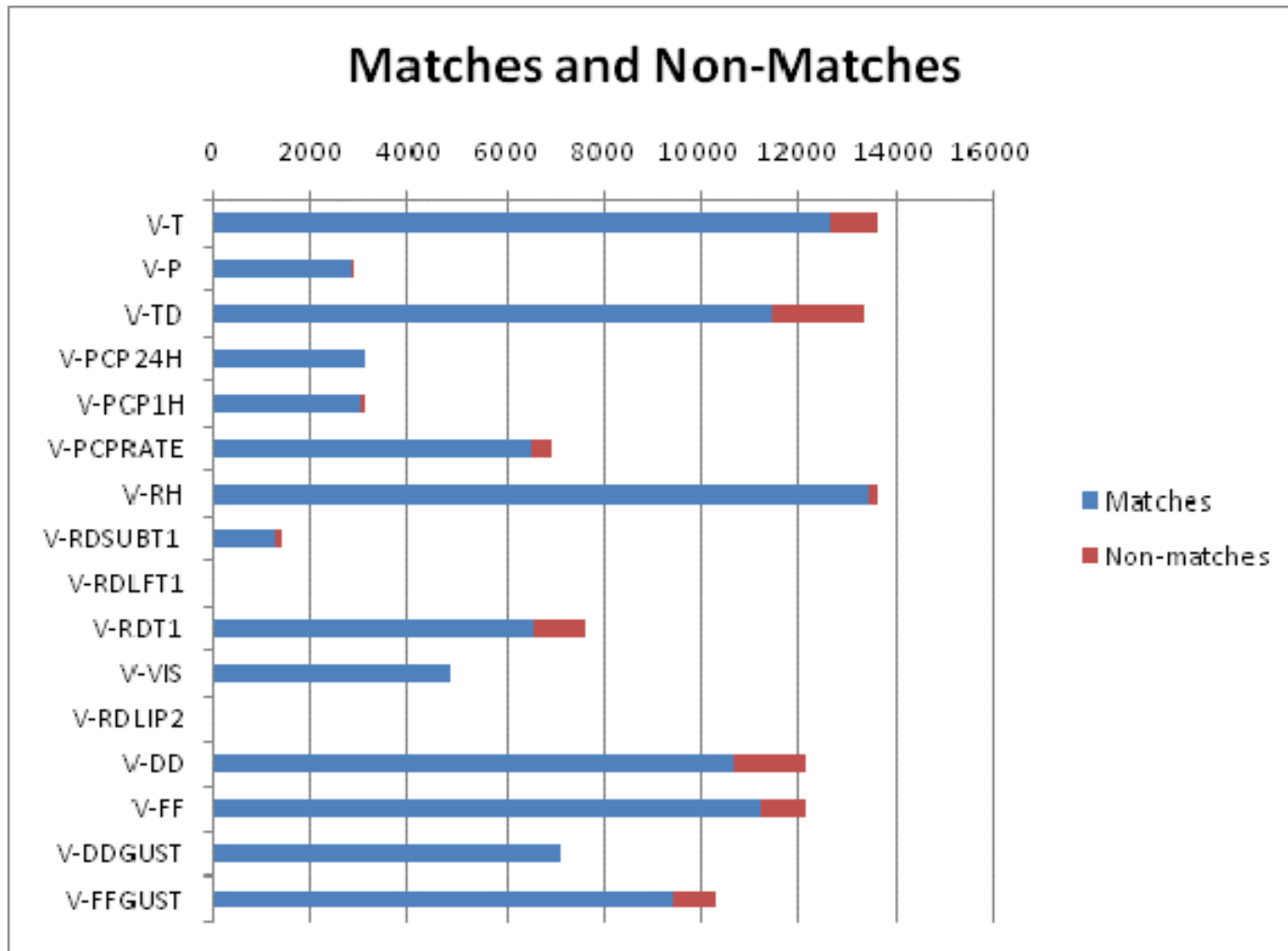


Variables That Occurred Most (over 50%) of the Time

<i>Clarus</i>	MADIS
essAirTemperature	T (Air temperature)
essRelativeHumidity	RH (Relative humidity)
windSensorAvgDirection	DD (Average wind direction)
essDewpointTemperature	TD (Dewpoint temperature)
	FF (Average wind speed)



MADIS and Clarus Matches and Non-Matches



Quality Checks

MADIS Quality Checks	<i>Clarus</i> Quality Checks
Validity (within specified set of tolerance limits)	Climate range, Sensor Range
Internal consistency	Like Instrument consistency
Temporal consistency	Step Quality
Statistical spatial consistency	
	Persistence Quality
Spatial consistency	Barnes Spatial Quality
	Dew point temperature
	Sea Level Pressure



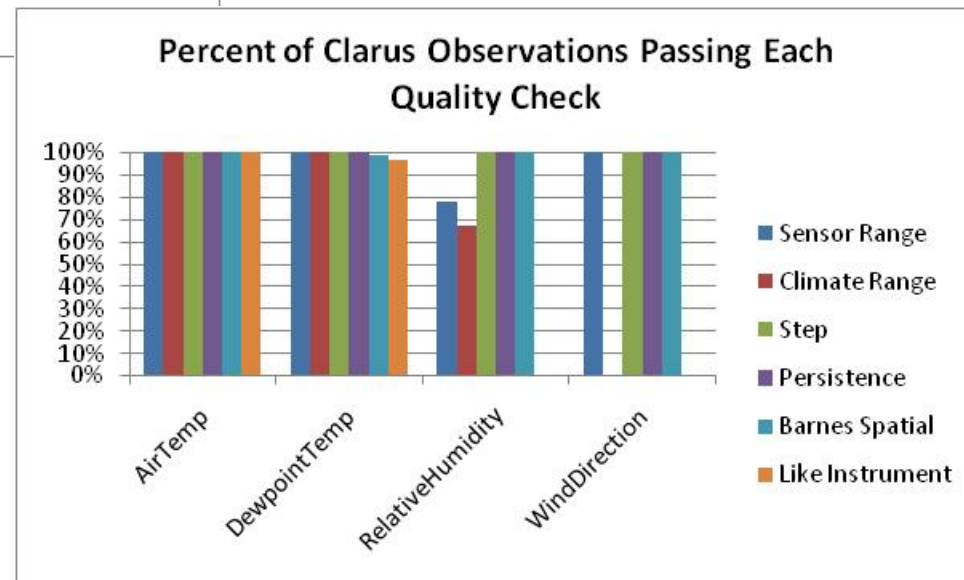
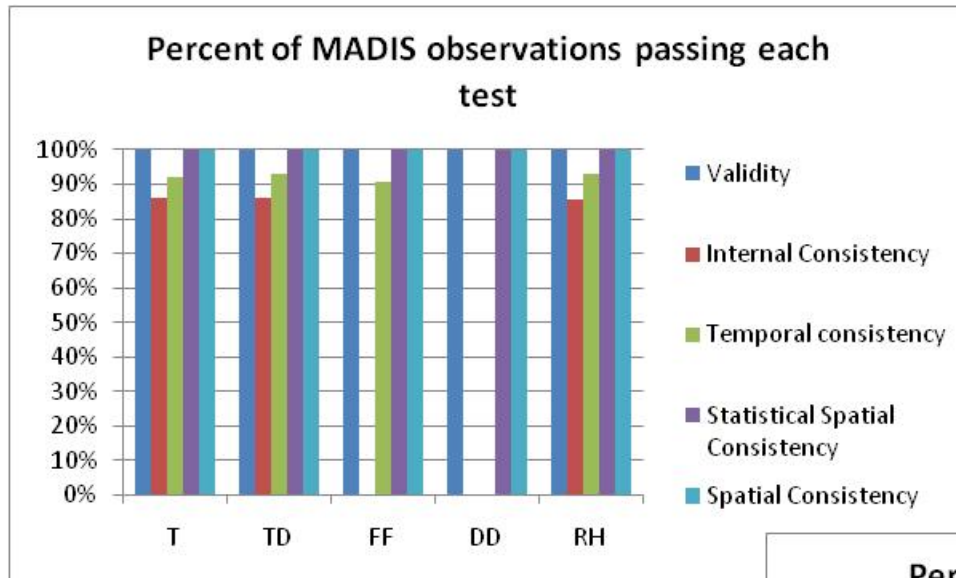
MADIS and *Clarus* Quality Check Results When Values Match

	Pass Clarus QC	Fail Clarus QC
Pass MADIS QC	72099	12747
Fail MADIS QC	17977	1435

Note: Reported as failure if any QC test fails



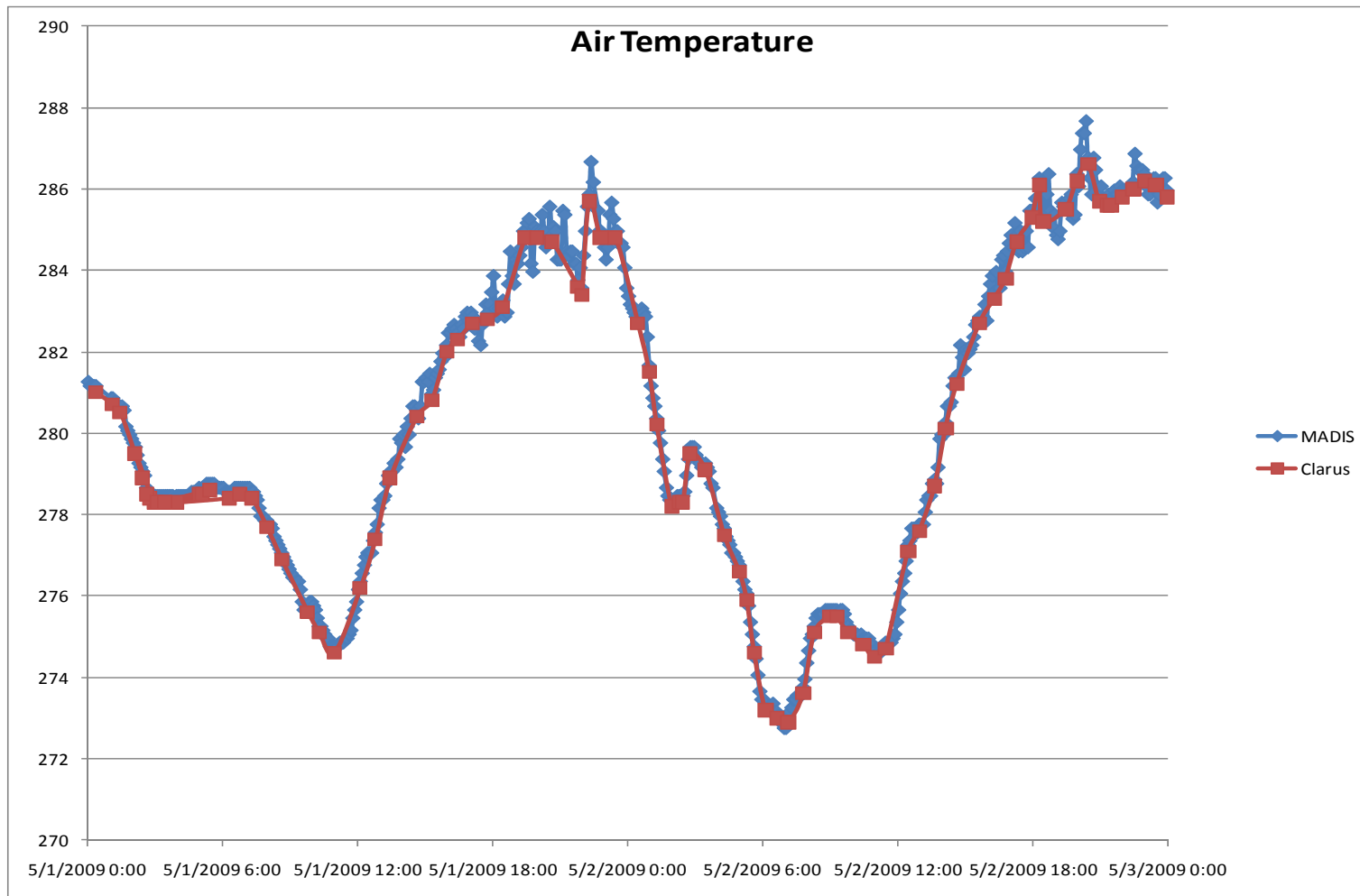
Quality Check Results by Variable



Note: Missing bar for *Clarus* when test is not applicable.



Sample Analysis of Temperatures



ESS Observations Analysis initial results

- Data collecting frequency was similar
- Rate of values matching for *Clarus* and MADIS was 93% (99.9% for relative humidity and 85% for dewpoint temperature)
- Similar average age of data from online queries
- Same average response time for all online data queries
- MADIS and *Clarus* employ similar quality checks but the detailed algorithms are not the same. Evaluating the merit of the algorithms was outside the scope of the report

