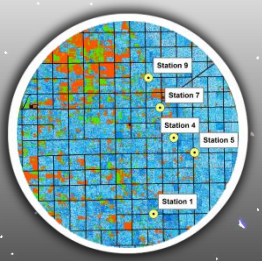
Agriculture and Agri-Food Canada | Agriculture et Agroalimentaire Canada



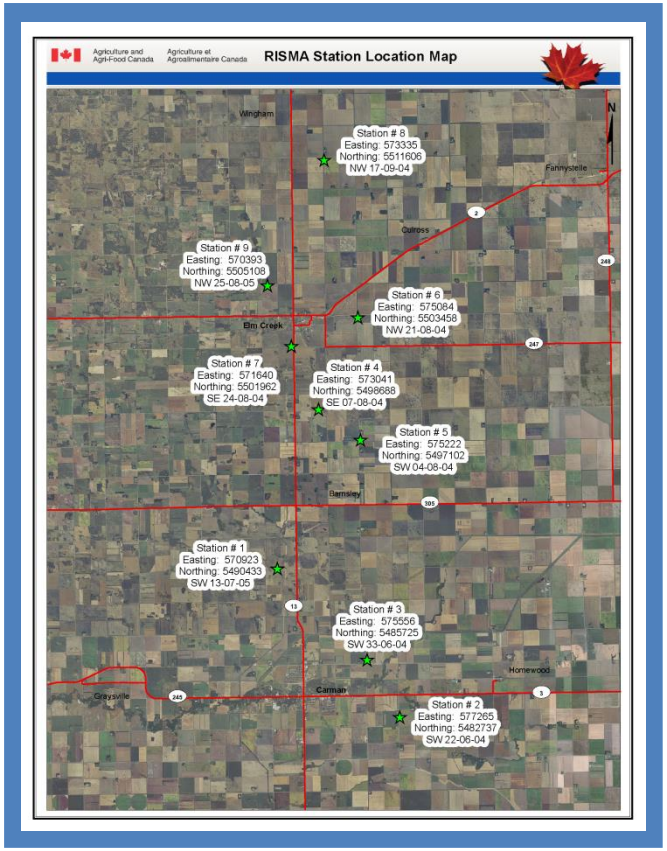
AAFC's RISMA Network: Validating SMAP L2SMP Products

Anna Pacheco, Heather McNairn, Jarrett Powers, Allan Howard, Patrick Rollin, Kurt Gottfried, Jacqueline Freeman, and Matthew Friesen

Science and Technology Branch

Canada

Carman – AAFC
Carman, Manitoba, Canada
Network Status



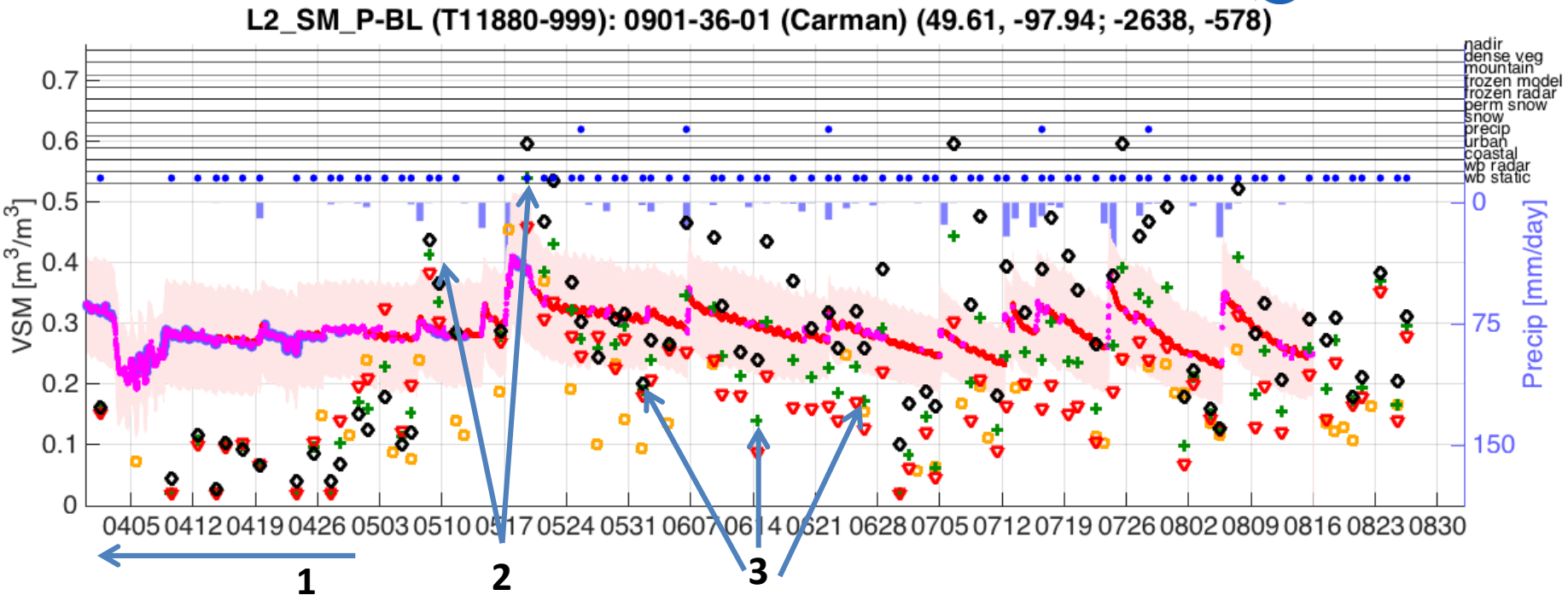
- SMAP Soil Moisture
- 9 stations (points)
- Near real-time, wireless
- 1 hour from data collection

Measurement Type	Method	Depths
Soil moisture	Hydra sensors	0-5 cm; 5 cm; 20 cm; 50 cm; 100 cm.
Soil temperature	Hydra sensors	0-5 cm; 5 cm; 20 cm; 50 cm; 100 cm.

*Other measurements include air temperature, relative humidity, wind speed and direction, precipitation.

Comparing Carman (MB) Soil Moisture Data with SMAP

Jet Propulsion Laboratory
California Institute of Technology



- In Situ
- SCA-H
- SCA-V
- DCA
- SMOS SM

Observations:

1) Data should be removed from the dataset due to freeze conditions; consider increasing the frozen flag to 4°C (not 0°C)
2) Increases in soil moisture (>20%); SMAP seems to be over-sensitive; >50% soil moisture is excessive, sometimes greater than water holding capacity (measured during soils surveys)
3) Dry down from SMAP too rapid given that rainfall has been consistent with little extended drying events; for example second point - ~13% on average is way too low given clays present in pixel

Potential Sources of Errors

- L2SMP Soil Moisture Algorithm
  - Modelling: dielectric model, model coefficients,
  - Parameterization (optical thickness, roughness, etc)
  - Ancillary datasets (soil texture, land cover, etc)
- Network Representation of SMAP pixel
  - Currently using area weighted function based on soil texture
  - Other scaling techniques?
- In-situ Network
  - 0-5 cm vs 5-cm soil moisture depth
  - Freeze/thaw conditions
  - Dynamic range

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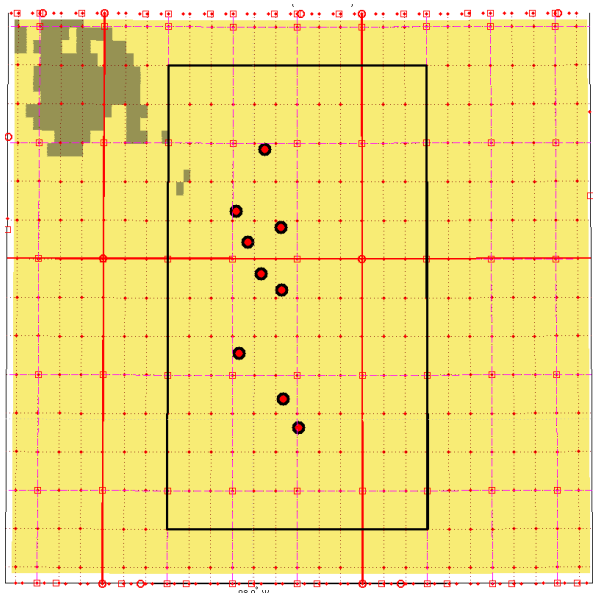
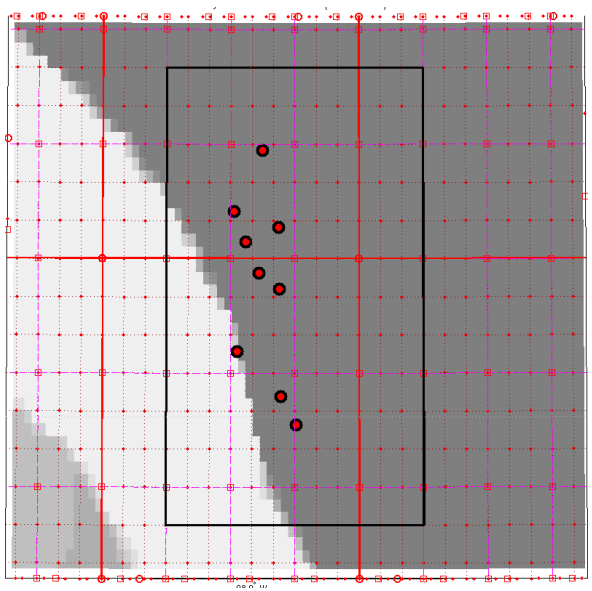
L2SMP Soil Fraction Input Dataset

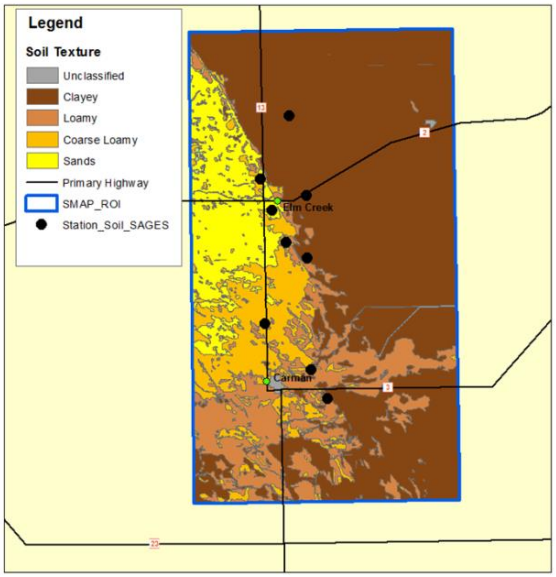
L2SMP 36-KM Pixel



L2SMP Clay Fraction



AAFC Clay Fraction



Climate class:
Cold (Dfb)
Dominant landcover:
Croplands
Soil texture:
S-%: 23
C-%: 35
BD: 1.18

Soil Texture Type	Percent Area
Unclassified	0.60
Rock	0.29
Clayey	46.48
Loamy	31.59
Coarse Loamy	8.73
Sands	10.95
Organic	1.37

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  - More samples? Benefit from SLAP F/T campaign in Fall 2015 in Carman (MB)

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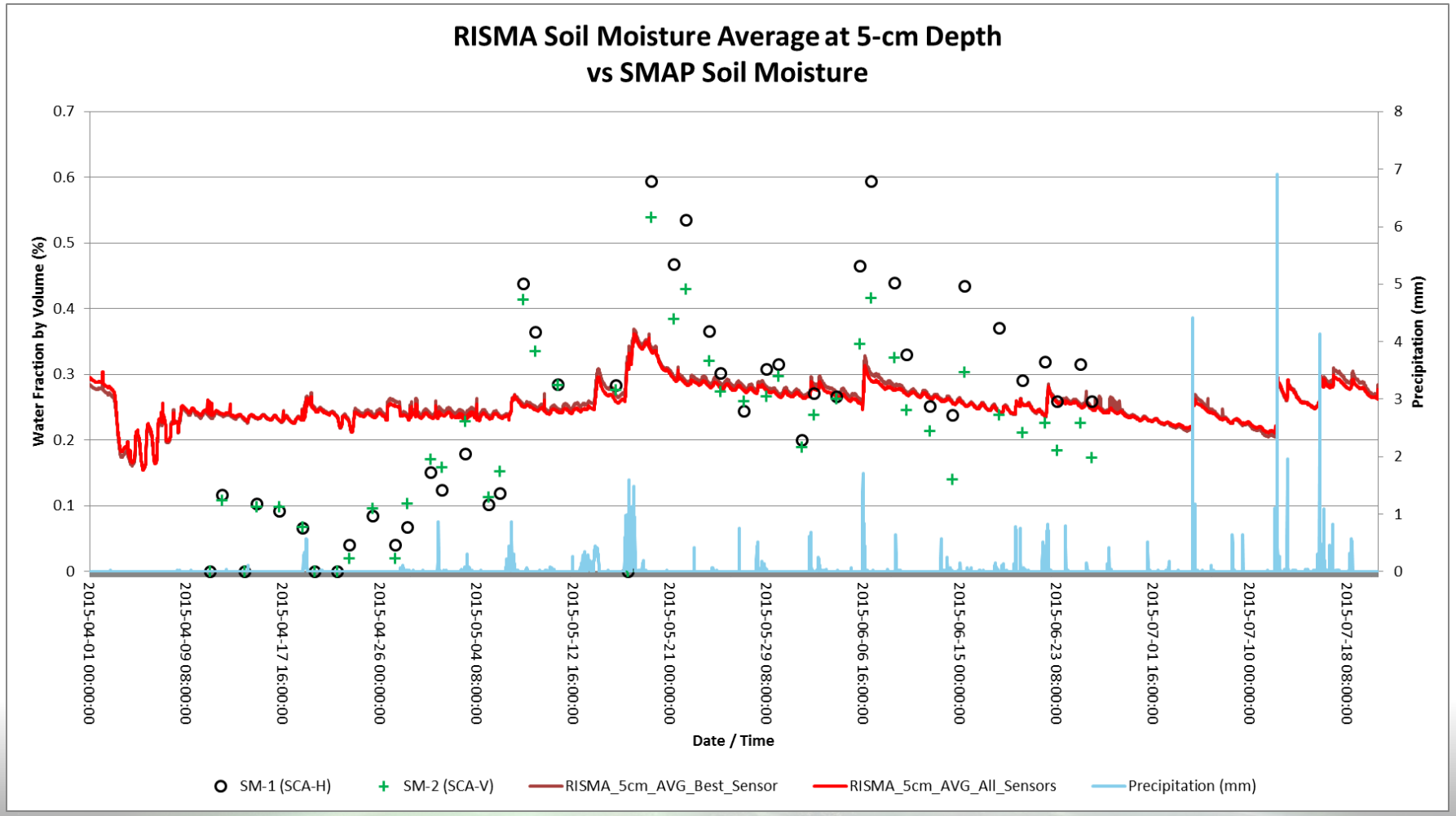
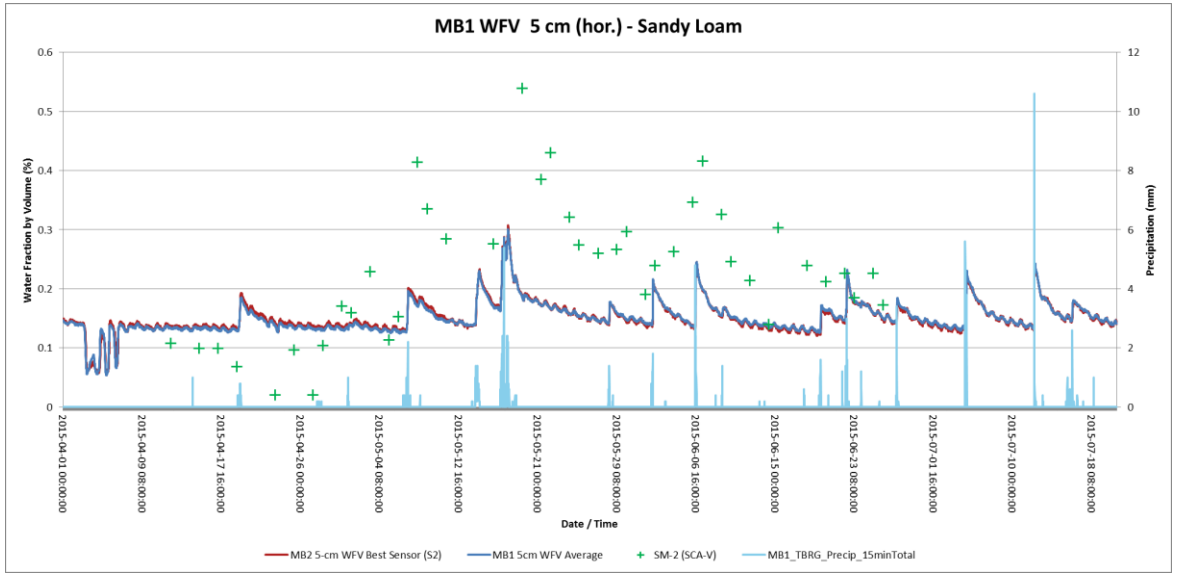
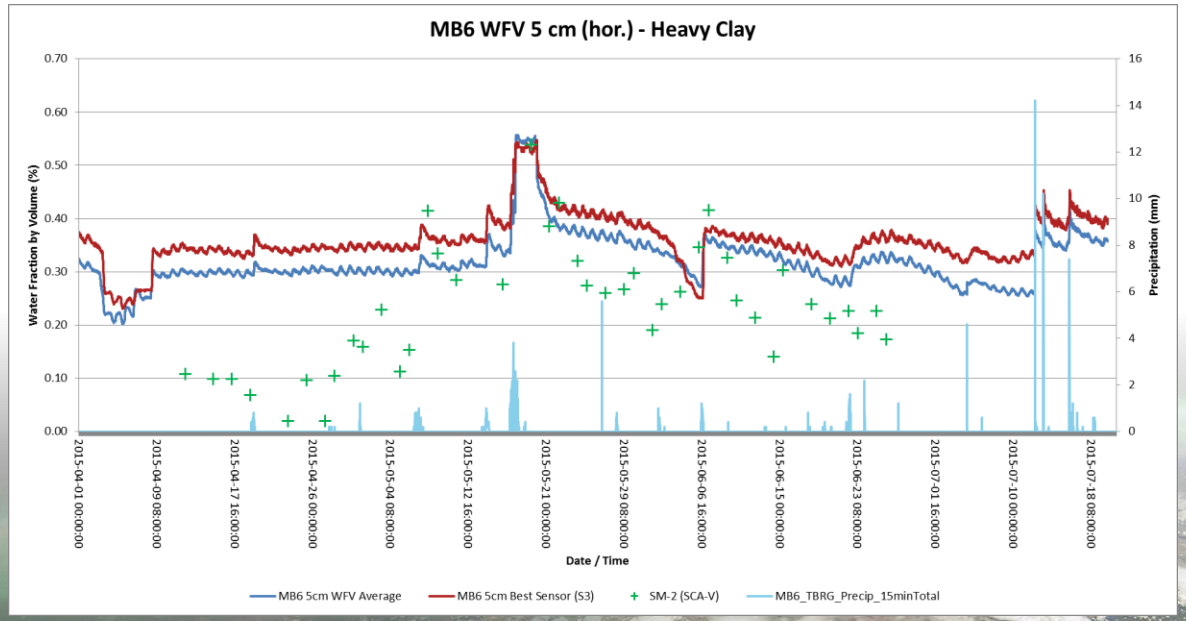
- In-situ Network
  - 0-5 cm vs 5-cm soil moisture depth
  - Frozen conditions should be better flagged
  - Dynamic range could be improved on a drier year
  - Issues with “stubborn” clays

AAFC Carman In Situ Soil Moisture vs SMAP Soil Moisture – A cleaner picture



Comparing the Clays and the Sands in Carman (MB)





"We choose to study clays, not because it is easy, but because it is hard."

- J. Powers at AAFC (borrowed from Kennedy):