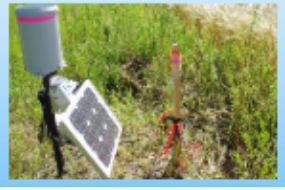
CanEx-SM10

Canadian Experiment for Soil Moisture in 2010





Overview and current status

Ramata Magagi and Imen Gherboudj (U. Sherbrooke), with contributions from

Aaron Berg (U. Guelph), Anne Walker (EC/CRD), Brenda Toth (EC/HAL), Tom Jackson (USDA), Kalifa Goïta (U. Sherbrooke), Stephane Belair, Heather McNairn (AAFC)

UNIVERSITÉ DE SHERBROOKE · Cartel · UNIVERSITY of GUELPH · Université du Québec École de technologie supérieure · Environment Canada · CSA ASC · Agriculture and Agri-Food Canada · USDA

Outline

- Introduction

  Context

  Objectives
- Study sites
- Data acquisition
- Samples of data (Preliminary analysis)

Introduction

- Context

  Understanding the water cycle
- Objectives

  Validation of **SMOS** (Soil Moisture and Ocean Salinity) and pre-launch validation of **SMAP** (Soil Moisture Active and Passive)

Joint efforts of Canadian and US researchers

Introduction

Financial partners:

Natural Sciences and Engineering Research Council of Canada- Strategic Program Grant (NSERC-SPG)

Environment Canada (EC)

Canadian Space Agency (CSA)

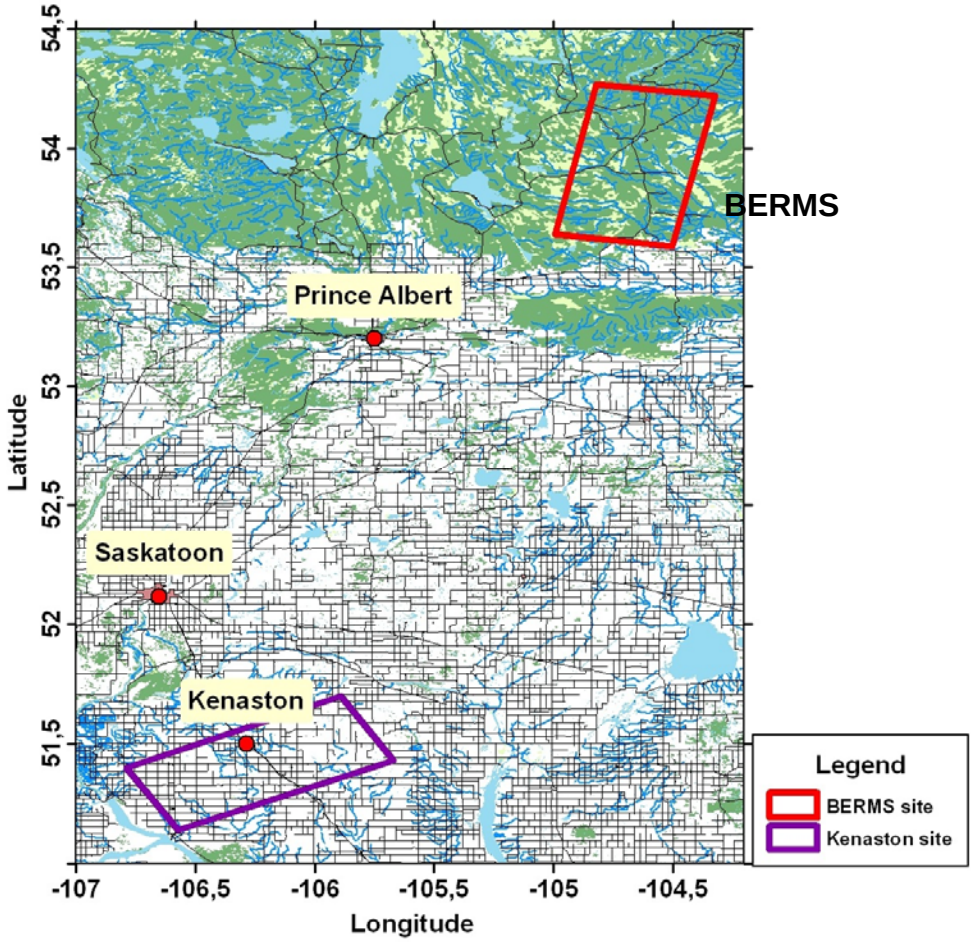
Agriculture and Agri-Food *Canada (AAFC*)

National Aeronautics and Space Administration (NASA)

Study sites

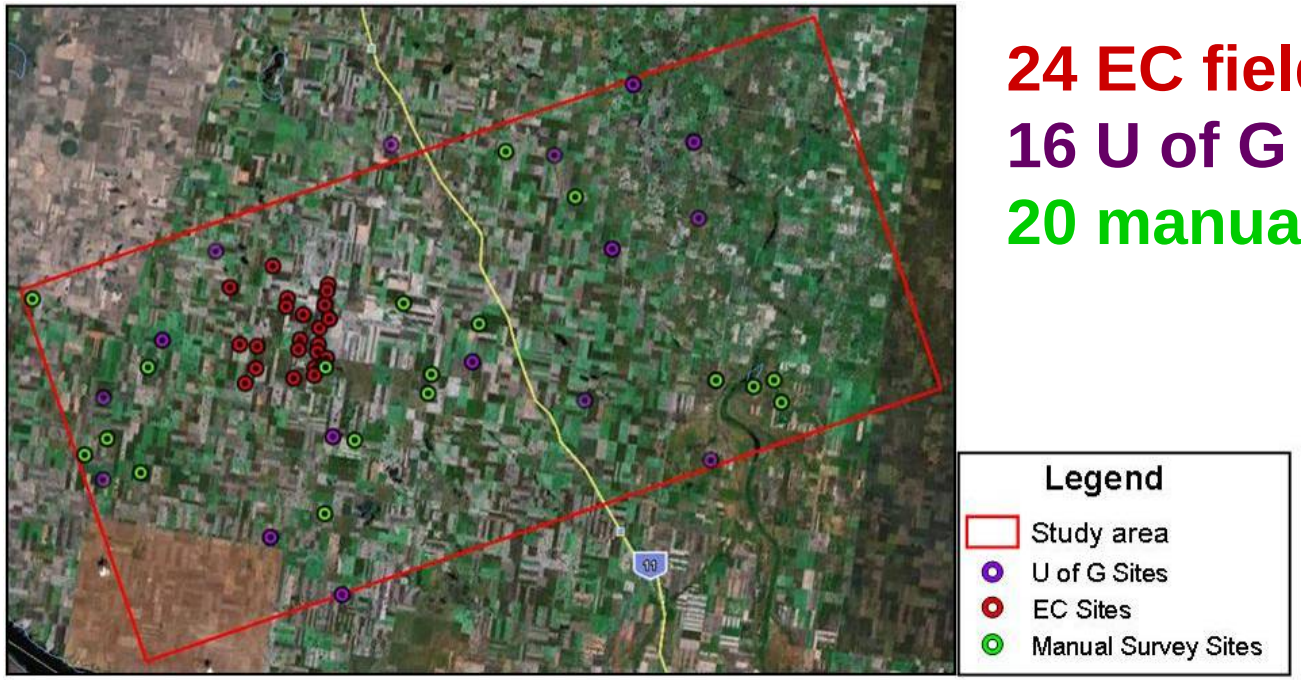
- BERMS
  Forested site

- Kenaston
  Agricultural site



Study sites

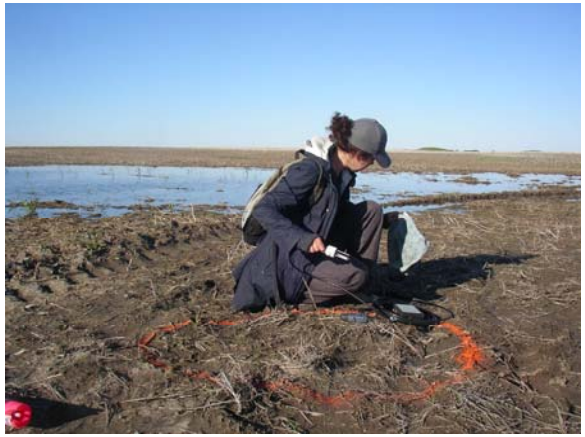
- Kenaston



24 EC fields
16 U of G fields
20 manual survey fields

Kenaston Site

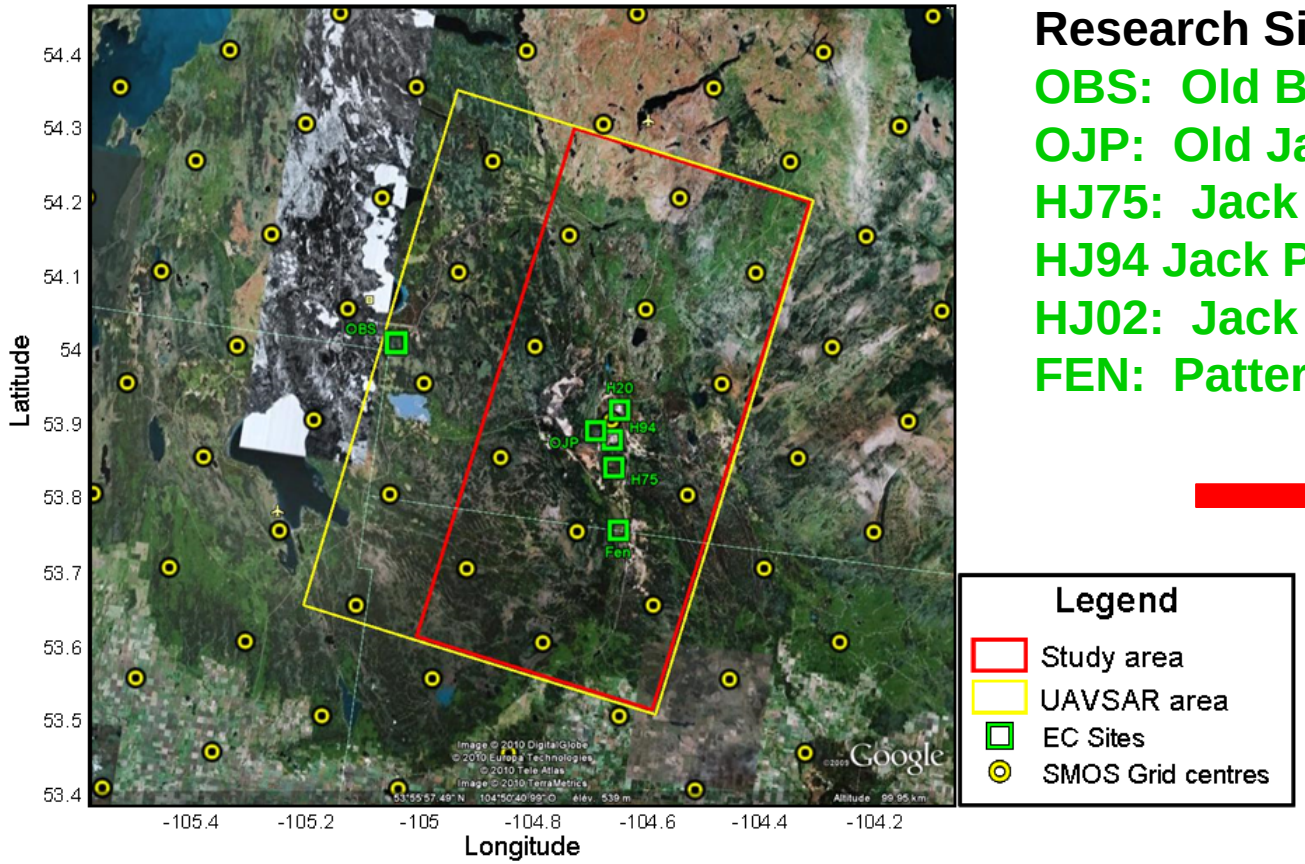
- Standing water during CanEx-SM10

Issue to consider in data analysis and algorithms development

Study sites

- BERMS



Research Sites:

OBS: Old Black Spruce

OJP: Old Jack Pine

HJ75: Jack Pine harvested in 1975

HJ94 Jack Pine harvested in 1994

HJ02: Jack Pine harvested in 2002

FEN: Patterned Fen

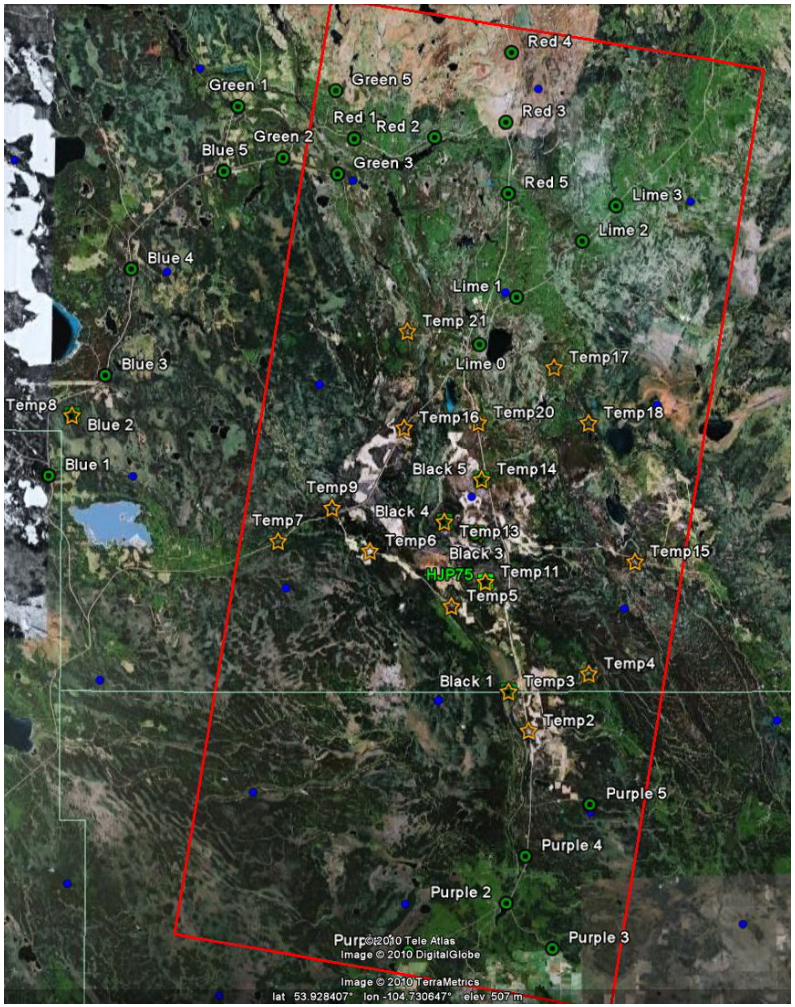
Long term network

Study sites

- **Soil moisture measurement locations (BERMS)**

BERMS Temporary Network co-located at each of the BERMS research sites (20 probes)

Ground Team Sampling



Data acquisition (1)

- Ground, airborne, satellite measurements

Measurements	Sites	Kenaston												Berms
	June 2010	1	2	3	5	6	8	9	10	11	12	13	14	16
Ground		-	√	√	√	-	-	-	√	√	-	√	√	√
Satellites	SMOS	√	√	√	√	√	√	-	√	√	√	√	-	√
	AMSR-E	√	√	√	√	√	√	√	√	√	√	√	√	√
	RADARSAT-2	√	√	-	√	-	√	-	-	√	√	-	-	-
	ASAR	-	-	-	-	√	-	-	√	-	-	√	-	√
	ALOS	-	-	-	-	√	-	√	-	-	-	-	√	-
Aircrafts	EC's Twin Otter NASA's UAVSAR	-	√	-	√	√	-	√	-	-	-	√	√	√

Data acquisition (2)

- Ground data

Roughness : s and l parameters from 3-m long profilometer

Soil moisture :

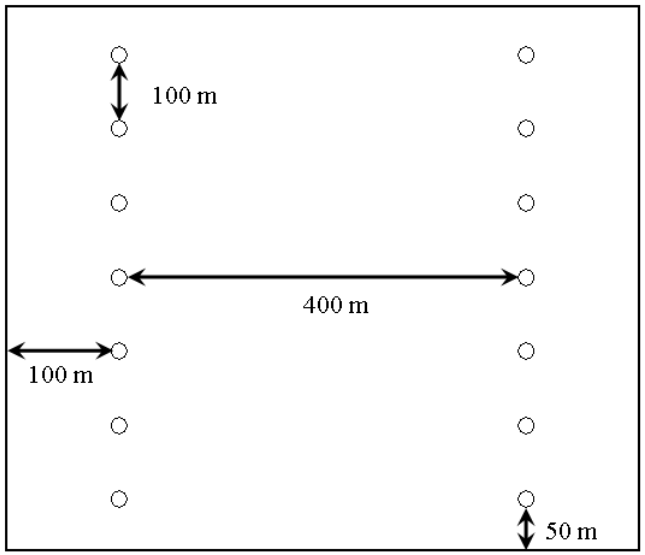
Sampling

In-situ Networks of Environment Canada, and U of Guelph

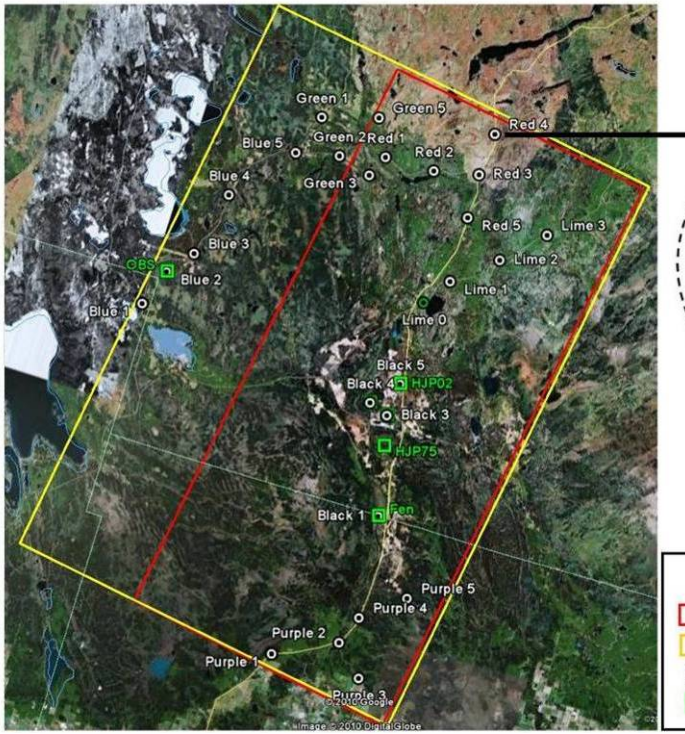
Vegetation characteristics : height, water content, density, etc.

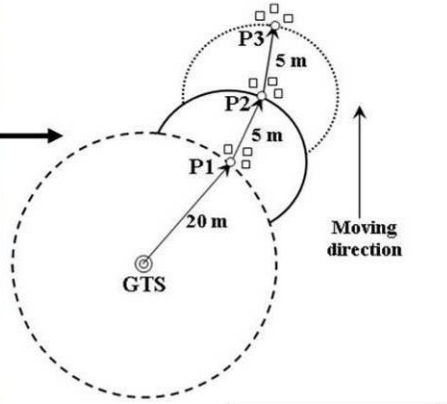
Soil moisture sampling strategies

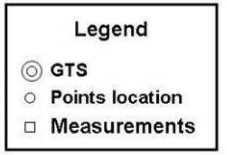
- Over Kenaston

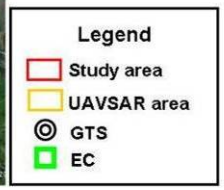


Over BERMS





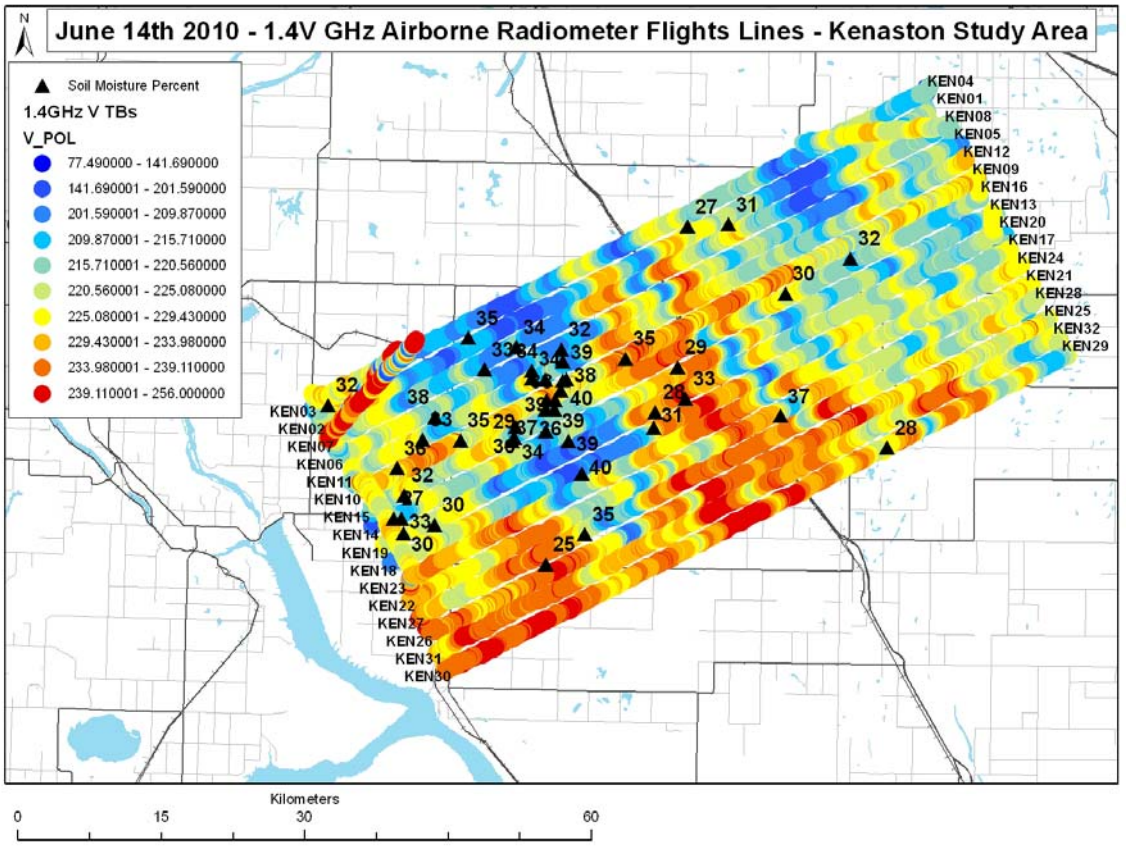




Samples of data

Airborne measurements

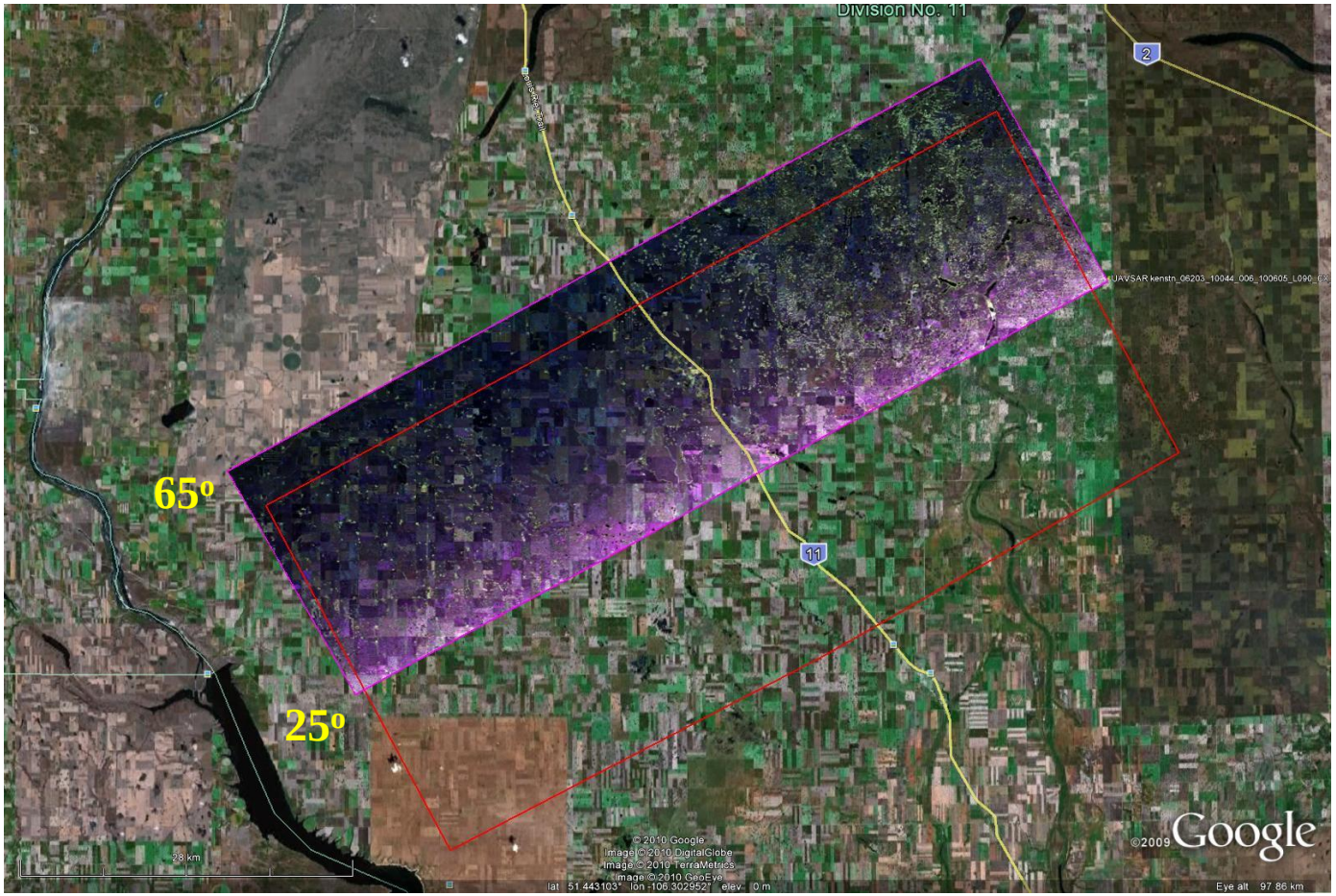
- Twin Otter L-band radiometer data (June 14, 2010)



(From Anne Walker, Aaron Berg, Brenda Toth)

Airborne measurements

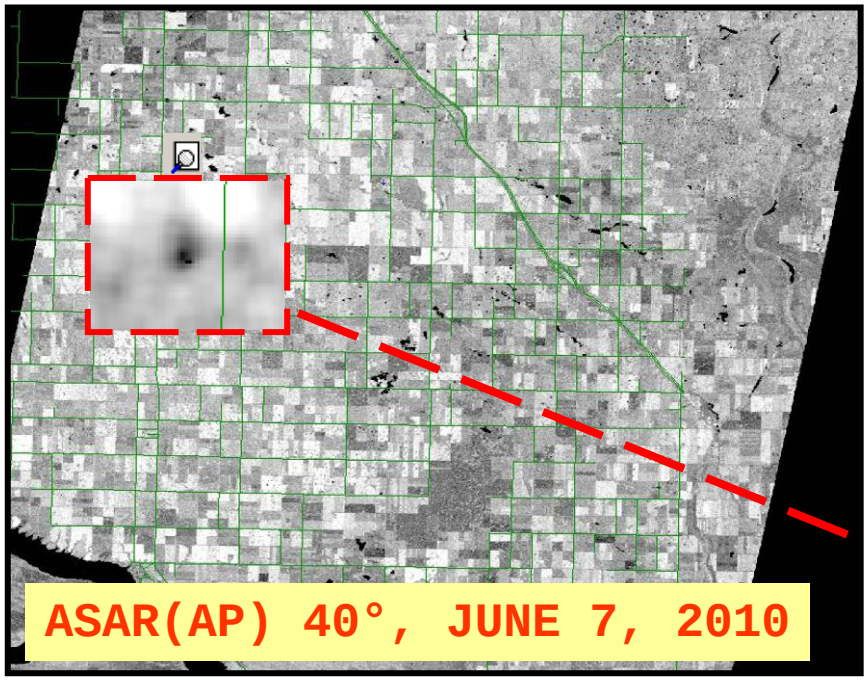
- UAVSAR composite radar image (HH, VV, HV) on June 5, 2010



(From Tom Jackson, USDA)

Satellite measurements

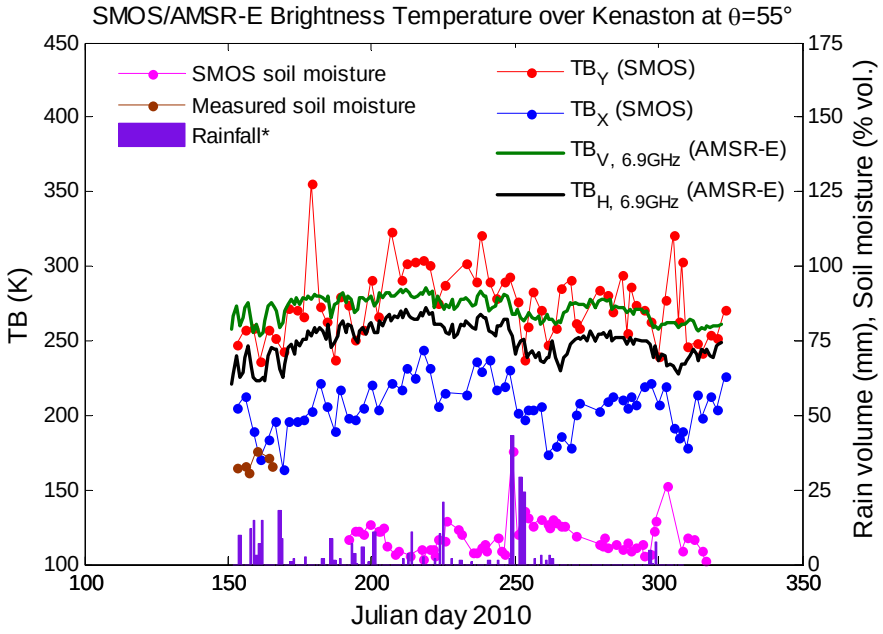
- ASAR-Envisat Kenaston Field L5: NE 01-29-05



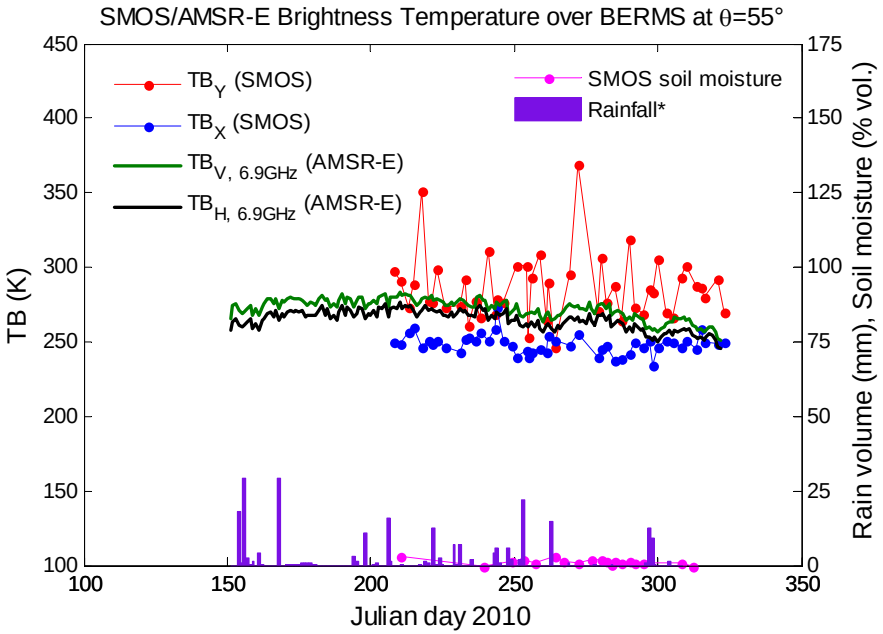
Satellite measurements

- Temporal profiles of SMOS (TBx and TBy) and AMSR-E (55 °)

Kenaston

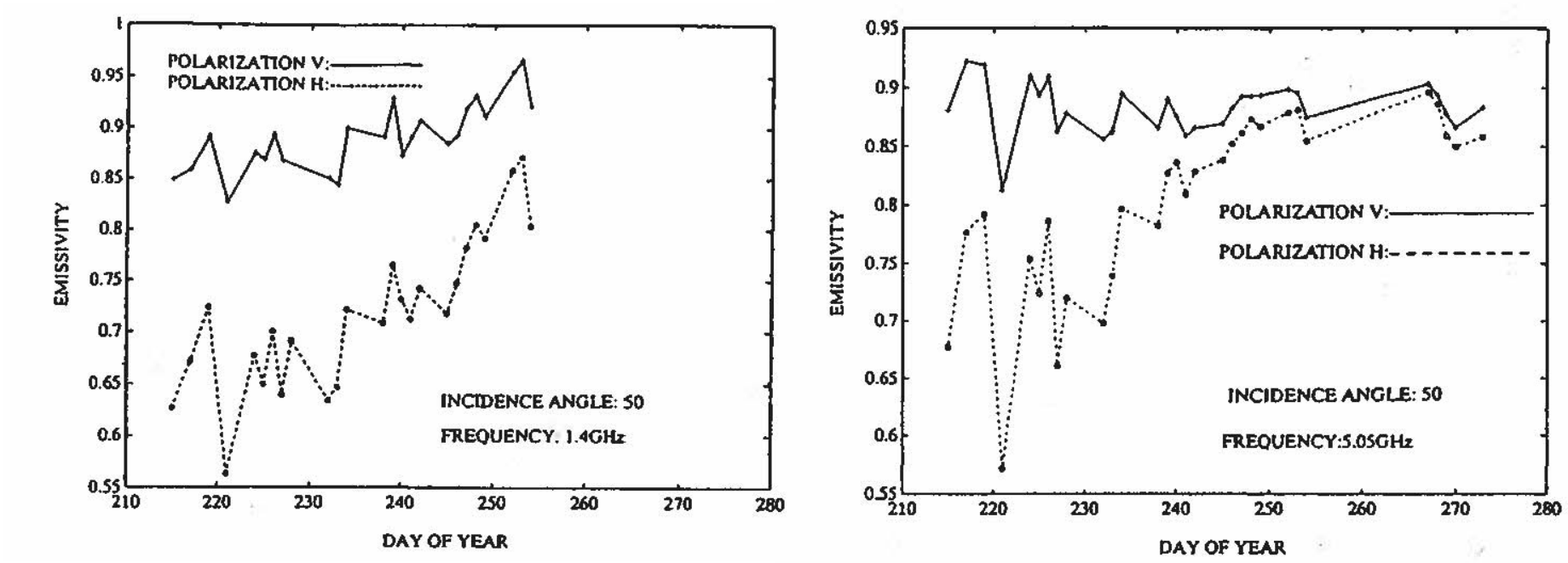


BERMS



Comparison with Kerr and Wigneron (1995)

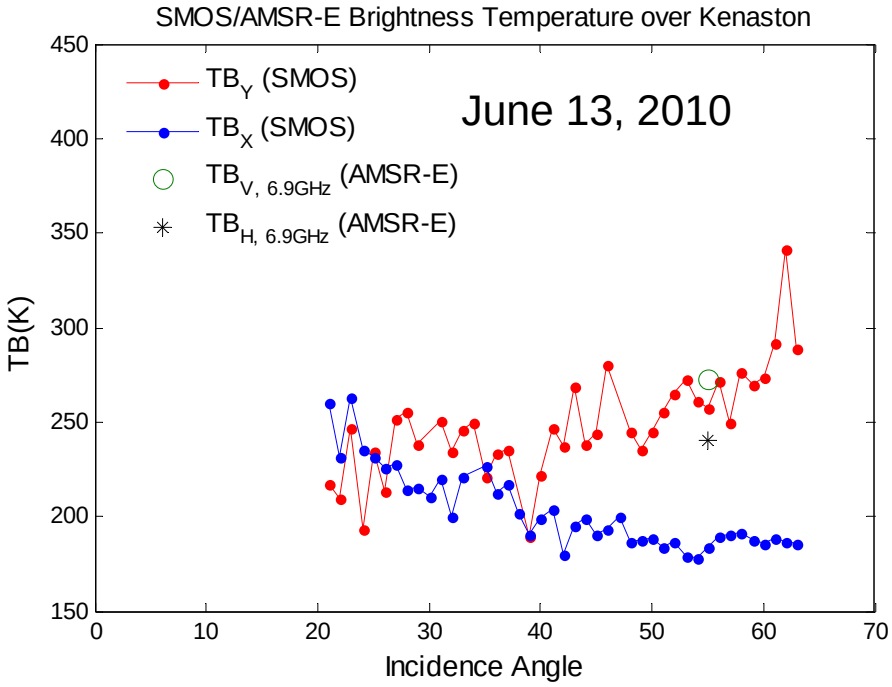
- Temporal evolution of soybean emissivity during the growing period

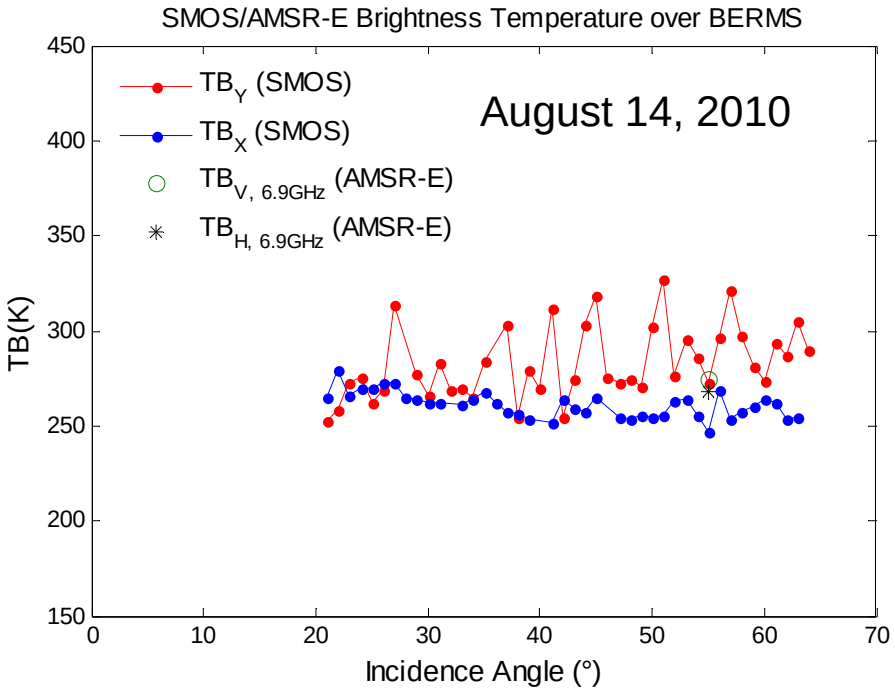


Satellite measurements

- Angular profile of SMOS (TBx and TBy) and AMSR-E (55 °)

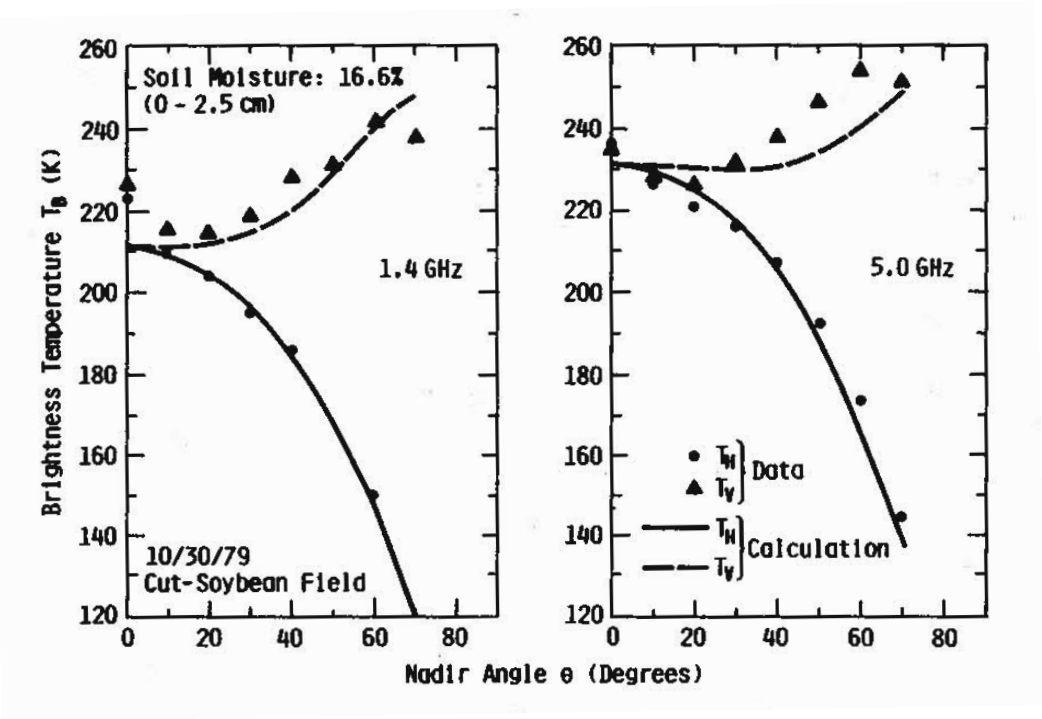
Kenaston **BERMS**



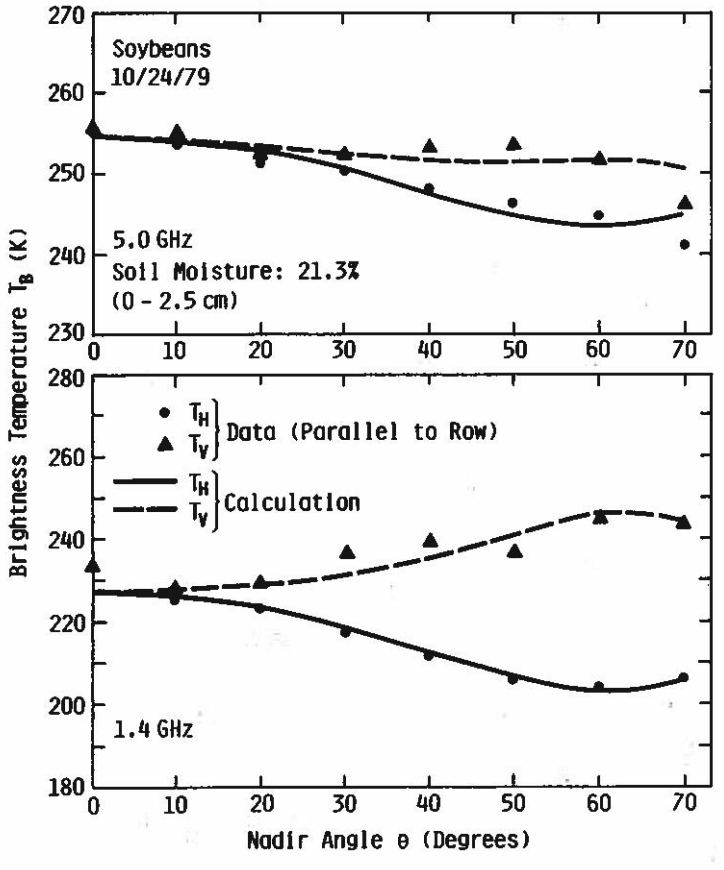


Comparison with Ulaby et al. (1986)

- Bare field



Soybeans fields



CanEx-SM10

For more information

http://www.pages.usherbrooke.ca/canexsm10/

- Data processing
- Data analysis
- Dissemination

} Current status

Availability of the data to public in 2012

Thanks!

References

- Ulaby F. T., MooreE R. K. and Fung A. K., 1986, *Microwave Remote Sensing, Volume 3*, Dedham, MA : Artech House.
- Kerr Y. and Wigneron J.-P., 1995, Vegetation models and observations. A review. In passive microwave remote sensing of Land-atmosphere Interactions. Eds B. J. Choudhury, Y. H. Kerr , E. G. Njoku and P. Pampaloni. Utrecht, the Netherlands.