

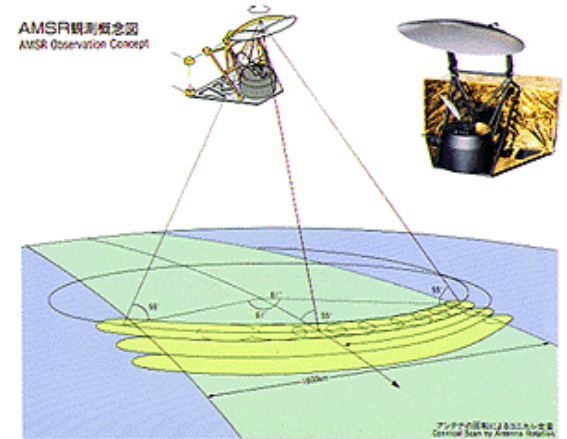
Microwave emissivity of land surfaces: experiments and models

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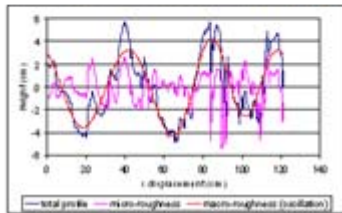
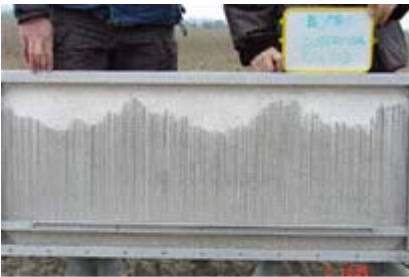
Introduction

- ❑ Experimental investigations conducted by the Microwave Remote Sensing Group made it possible to realize a wide archive of microwave emissivity of the following surface types:
 - bare soil with different levels of moisture and types of surface roughness
 - soil covered with wheat, corn, alfalfa, sunflower, natural grass at various level of biomass
 - deciduous and coniferous forests with different woody volumes
 - soil covered with snow in different conditions (dry and wet) and depth.
 - Ice sheet in Antarctica

Experimental equipments



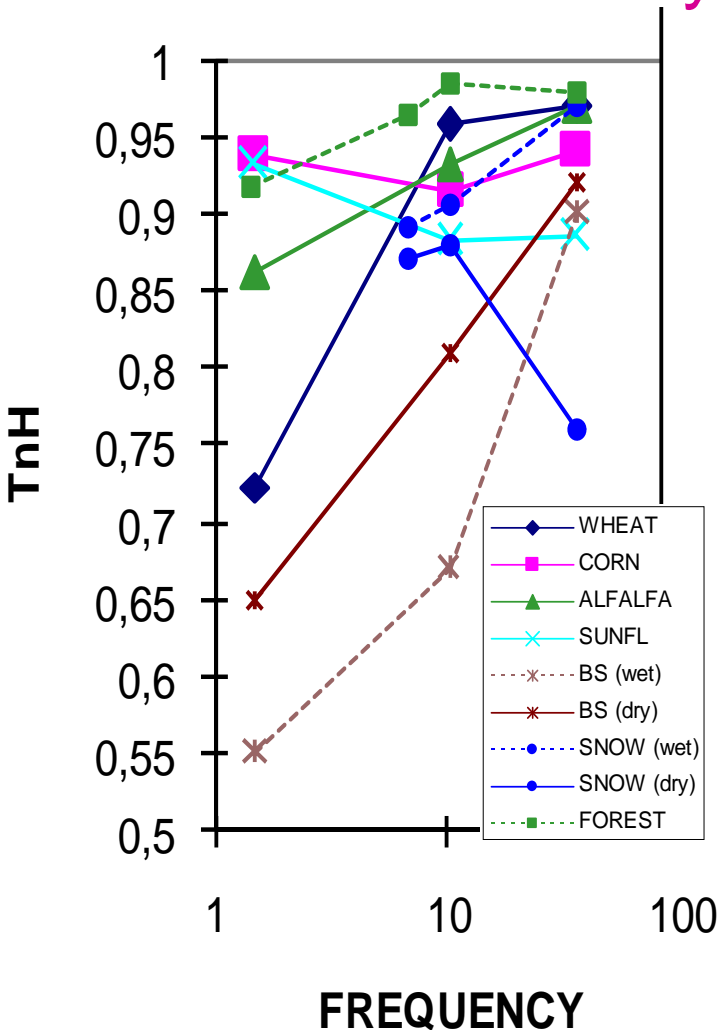
Ground measurements



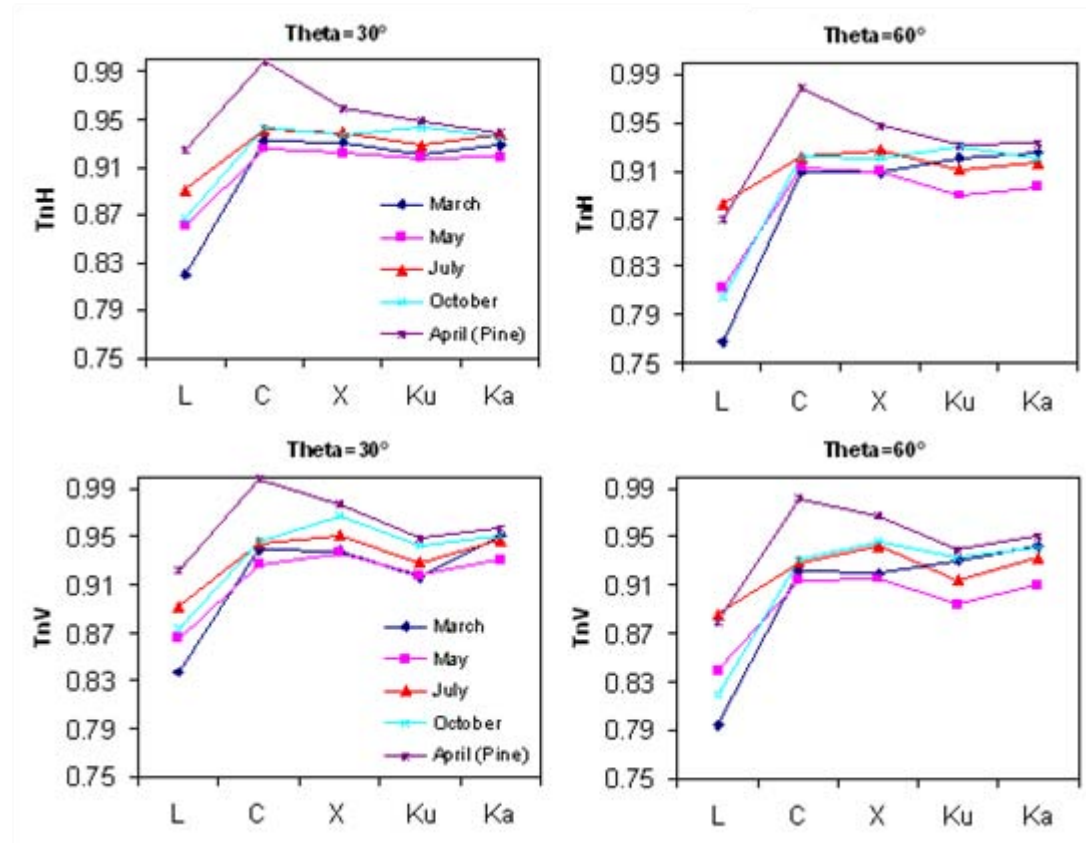


Experimental results: sensitivity to land features

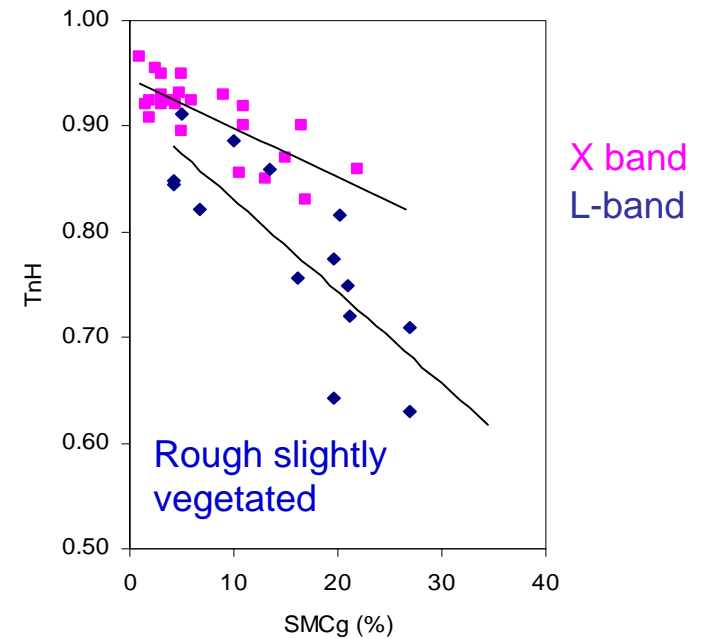
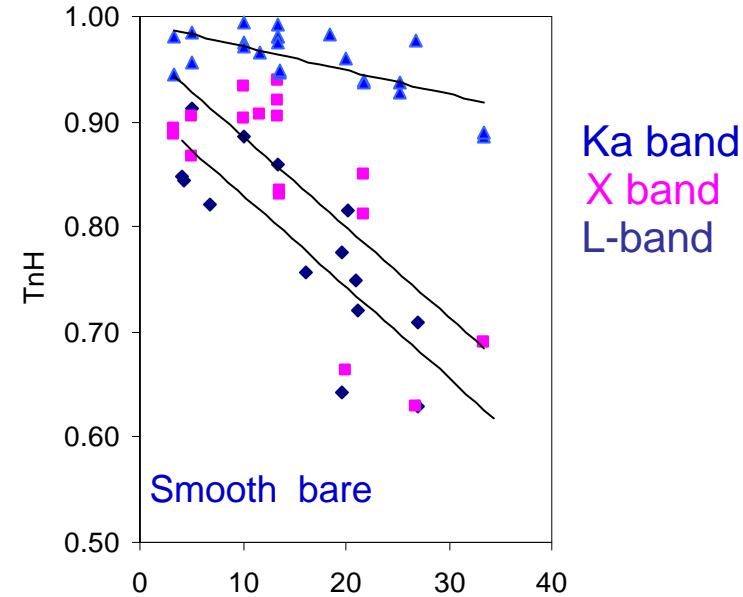
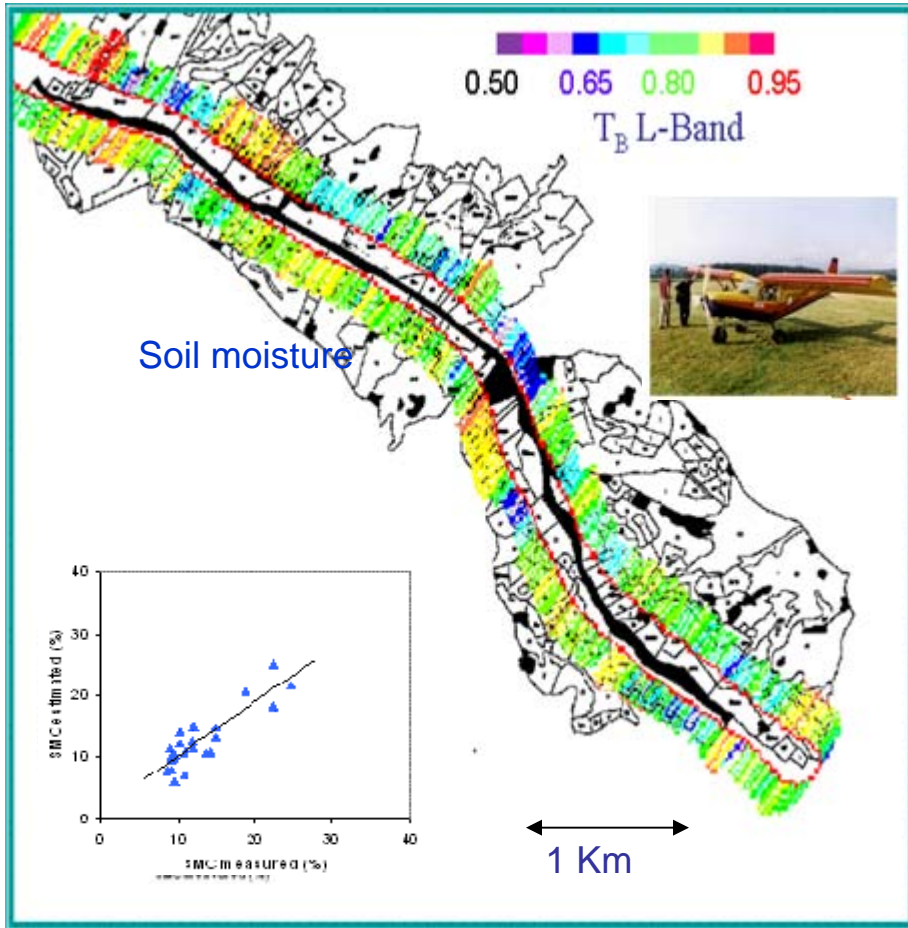
Emissivity spectra of land surfaces



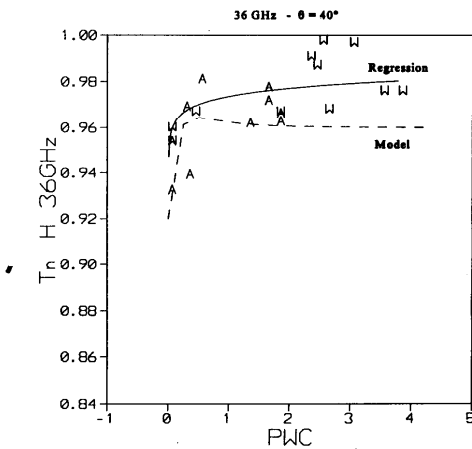
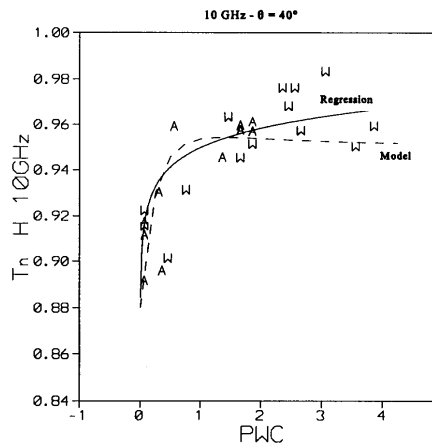
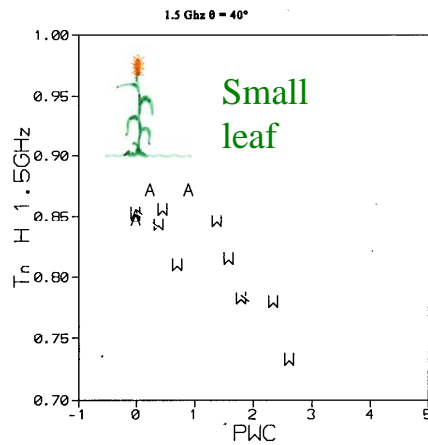
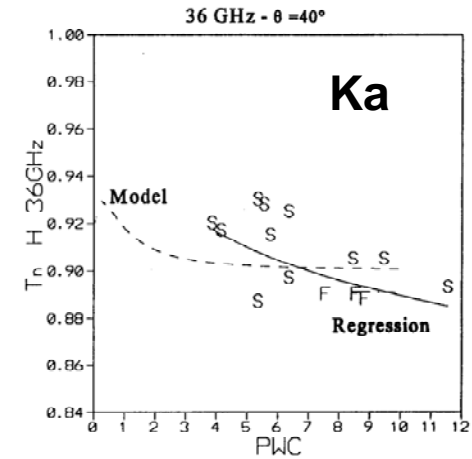
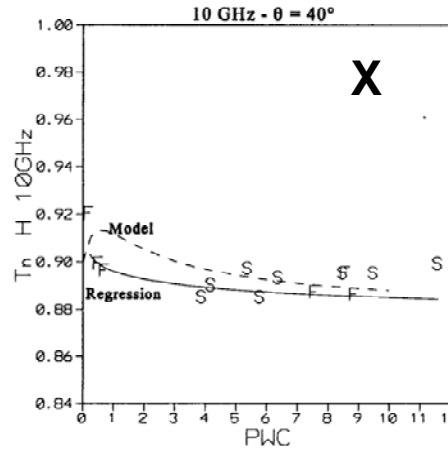
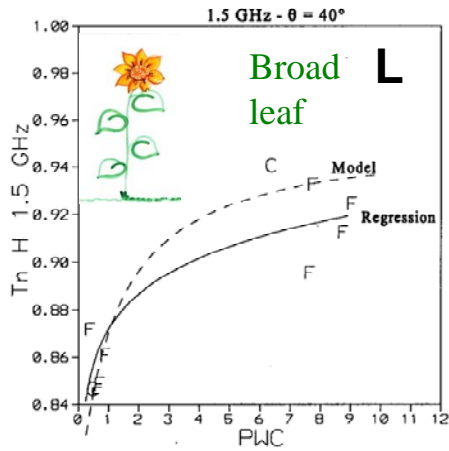
Emissivity spectra of forests (poplar)



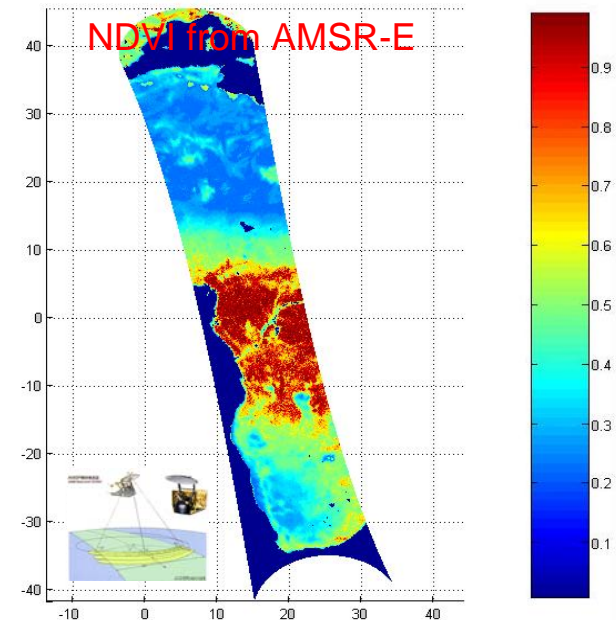
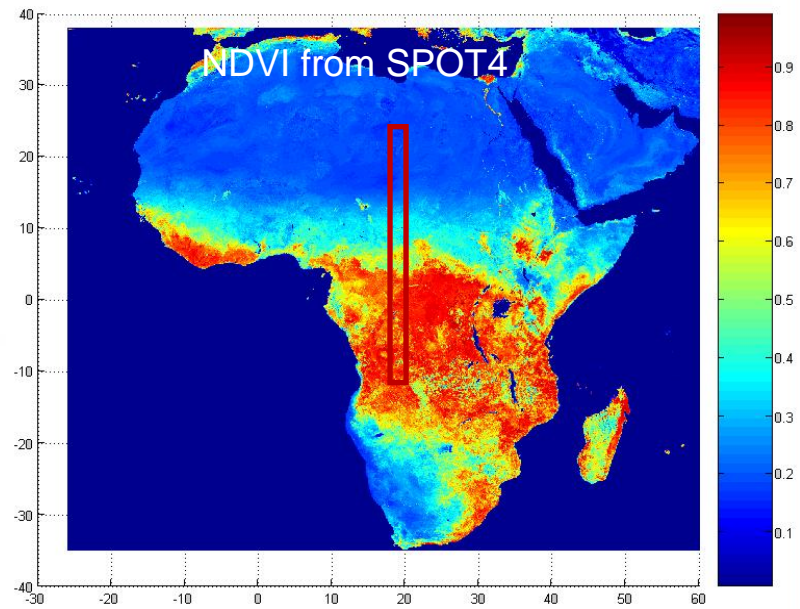
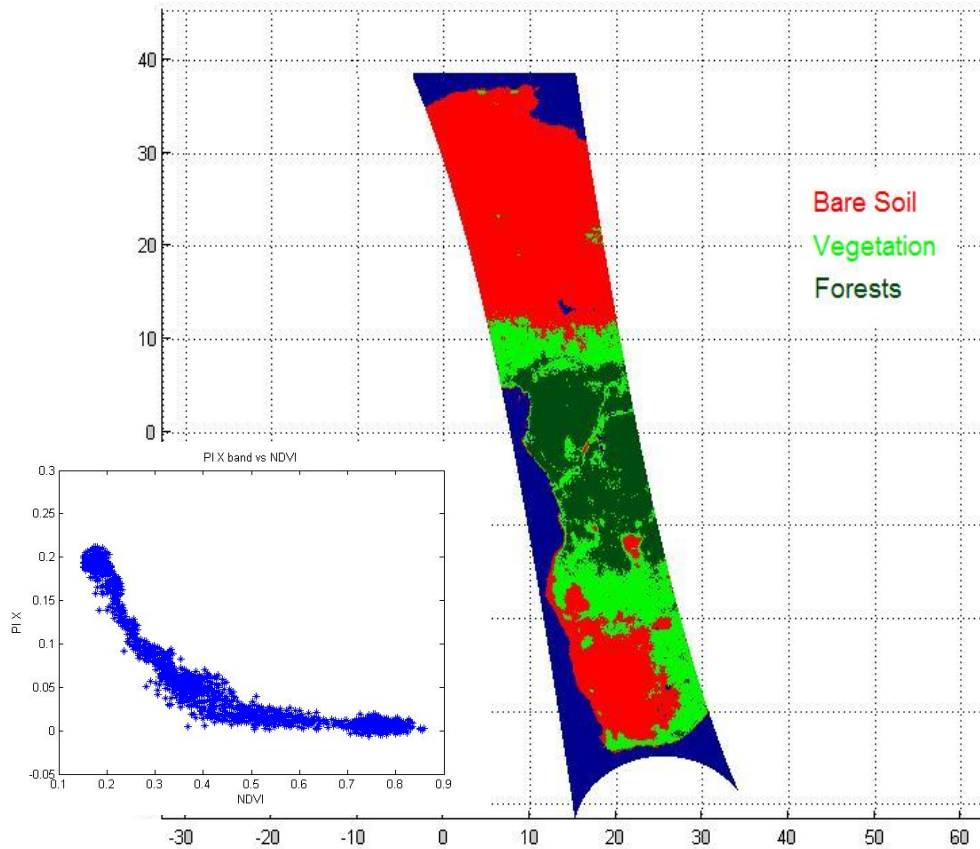
Emissivity of agricultural surfaces



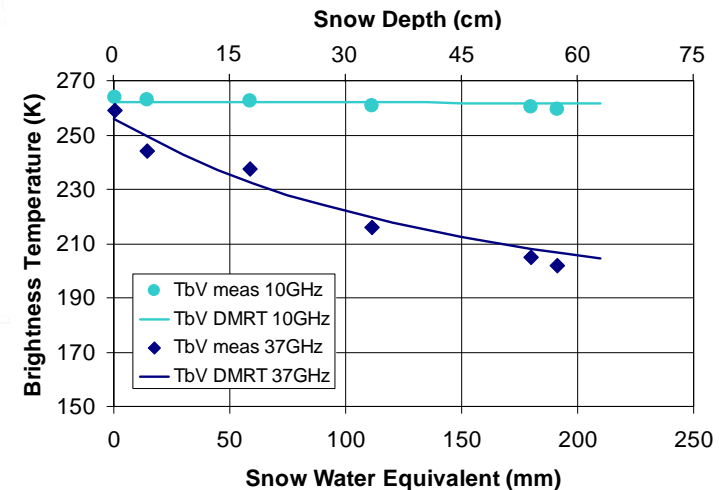
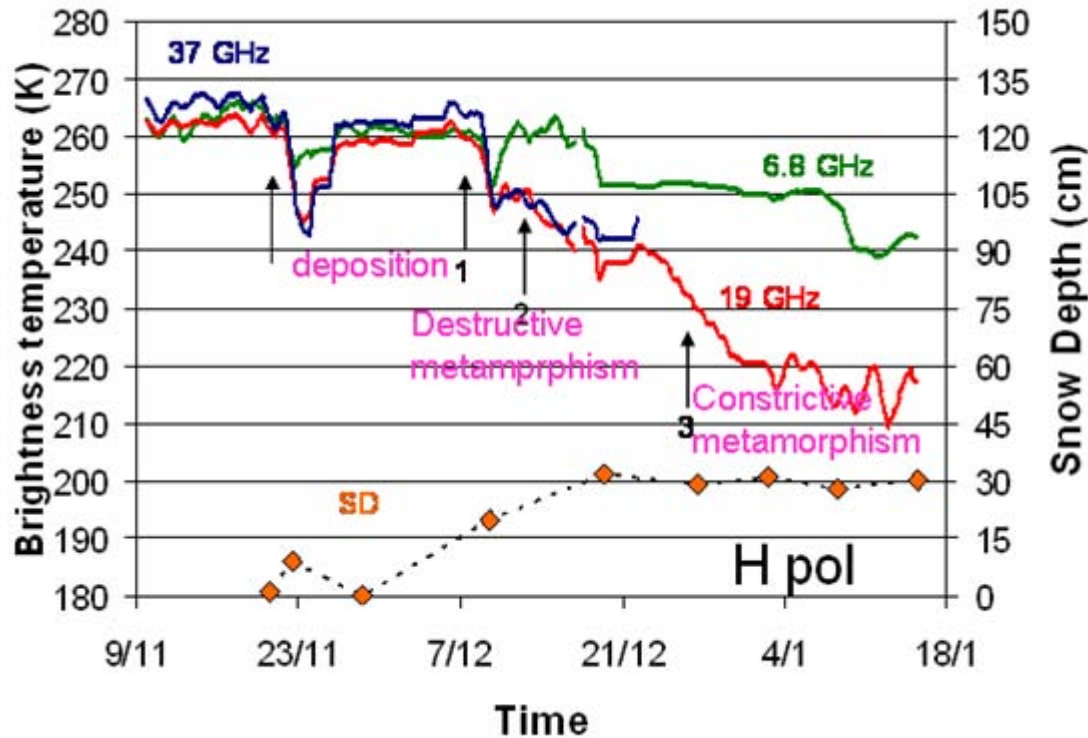
Sensitivity to Plant Water Content of crops emissivity



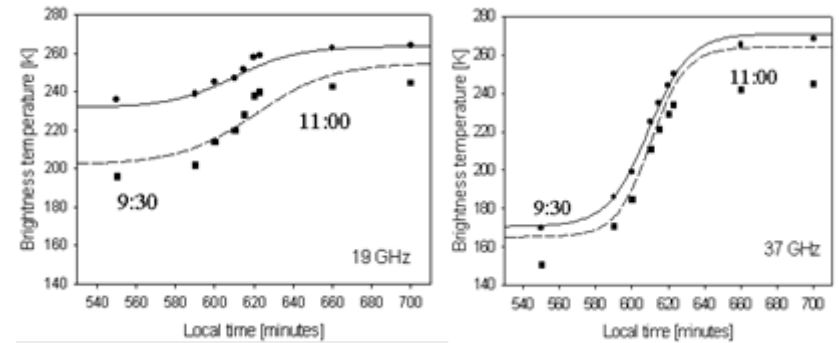
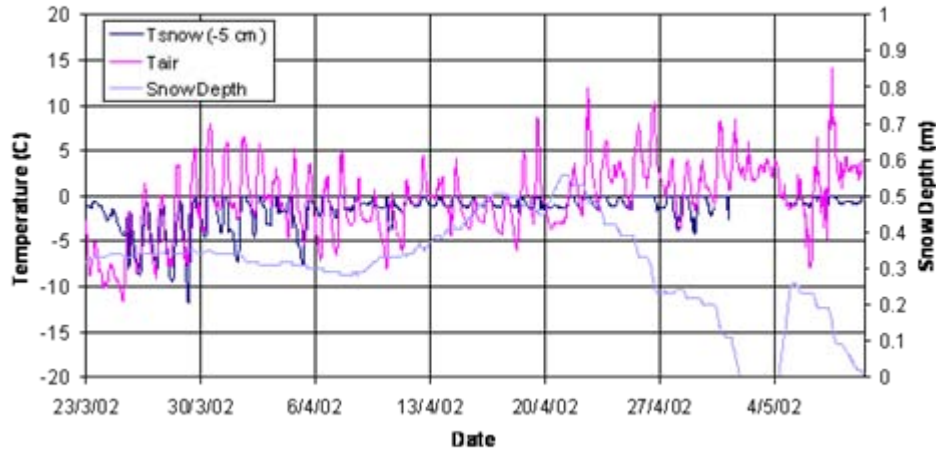
Sensitivity to vegetation (AMSR-E)



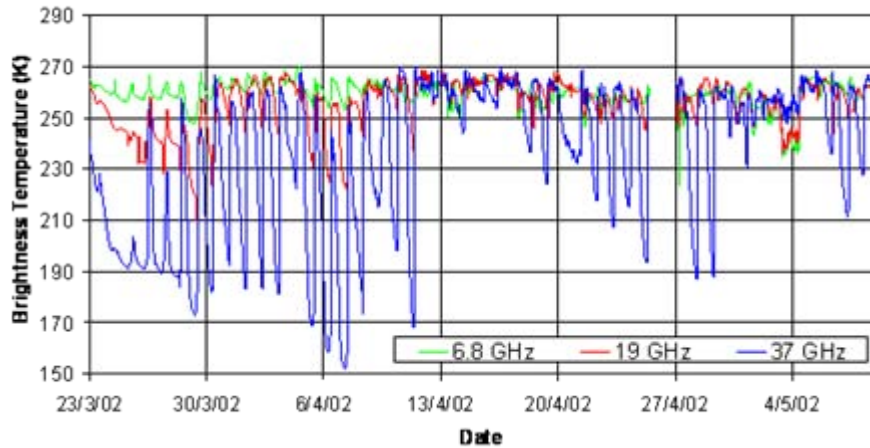
Sensitivity to snow cover: dry snow accumulation



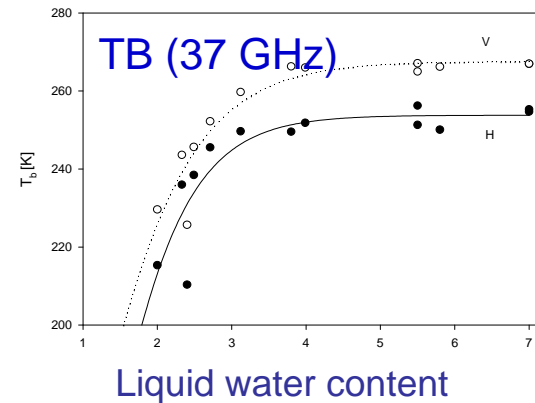
Sensitivity to snow wetness



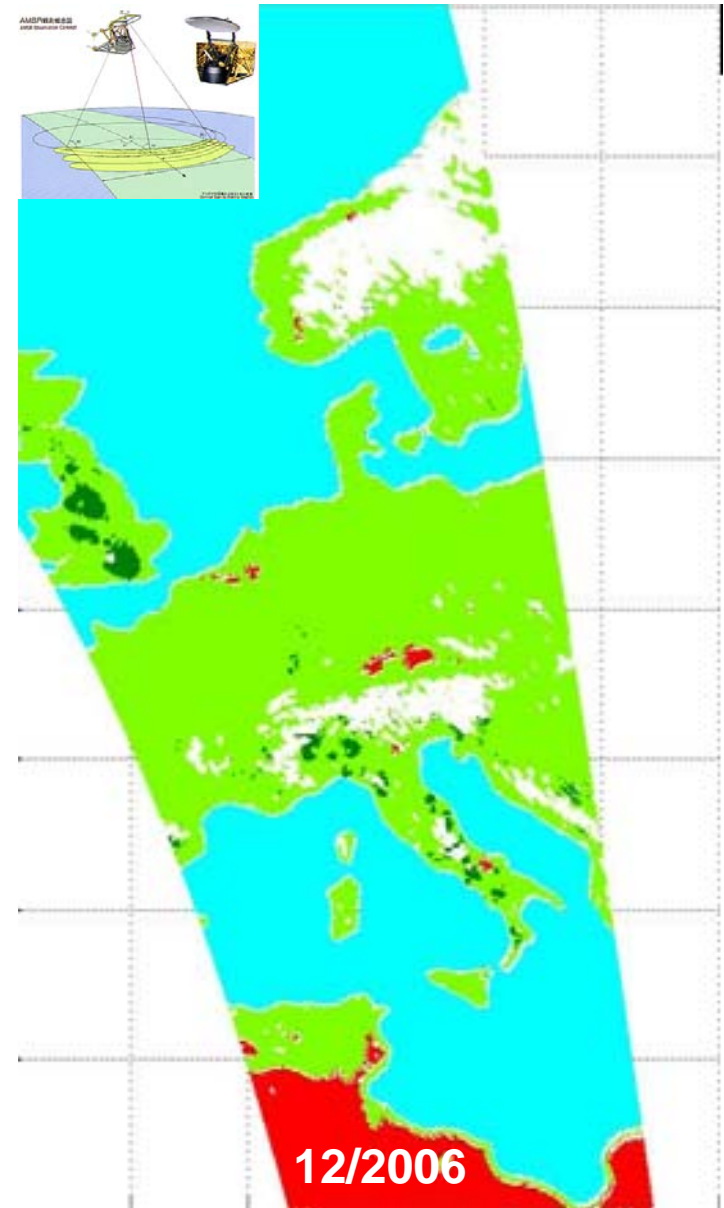
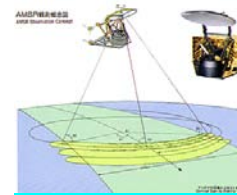
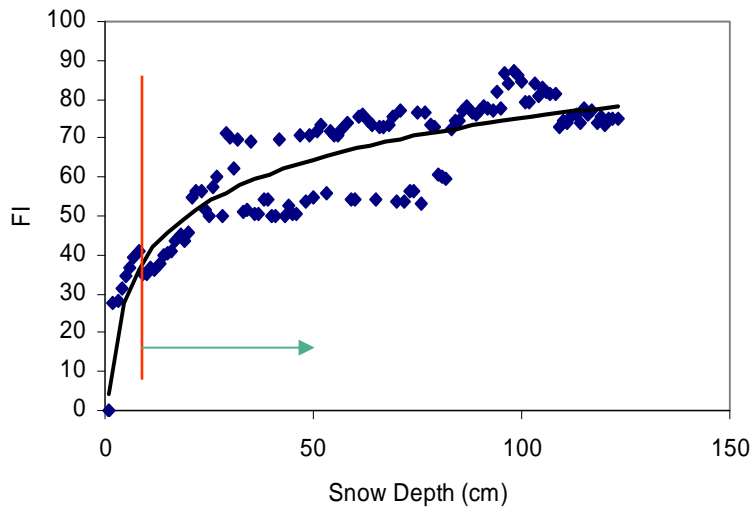
Capria et al. 2014



Melt-refreezing cycles



Sensitivity to snow cover (AMSR-E)



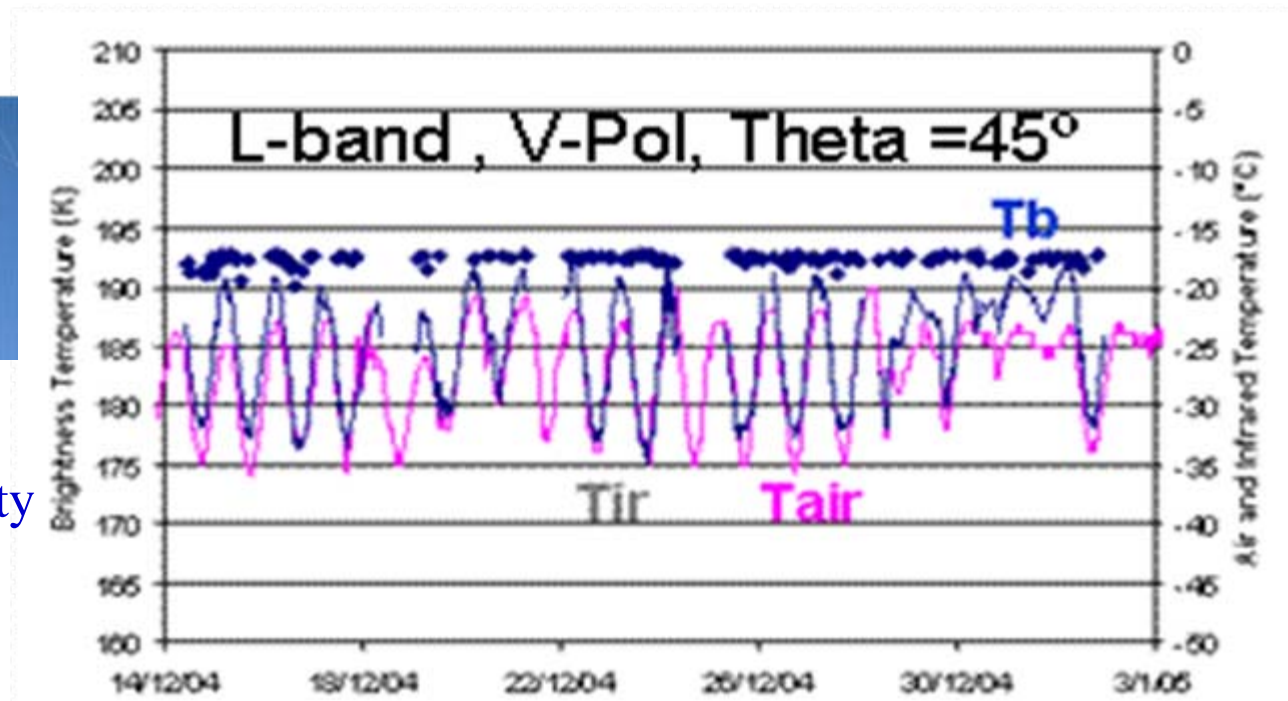
Antarctica: Temporal variability L-band

Ground based

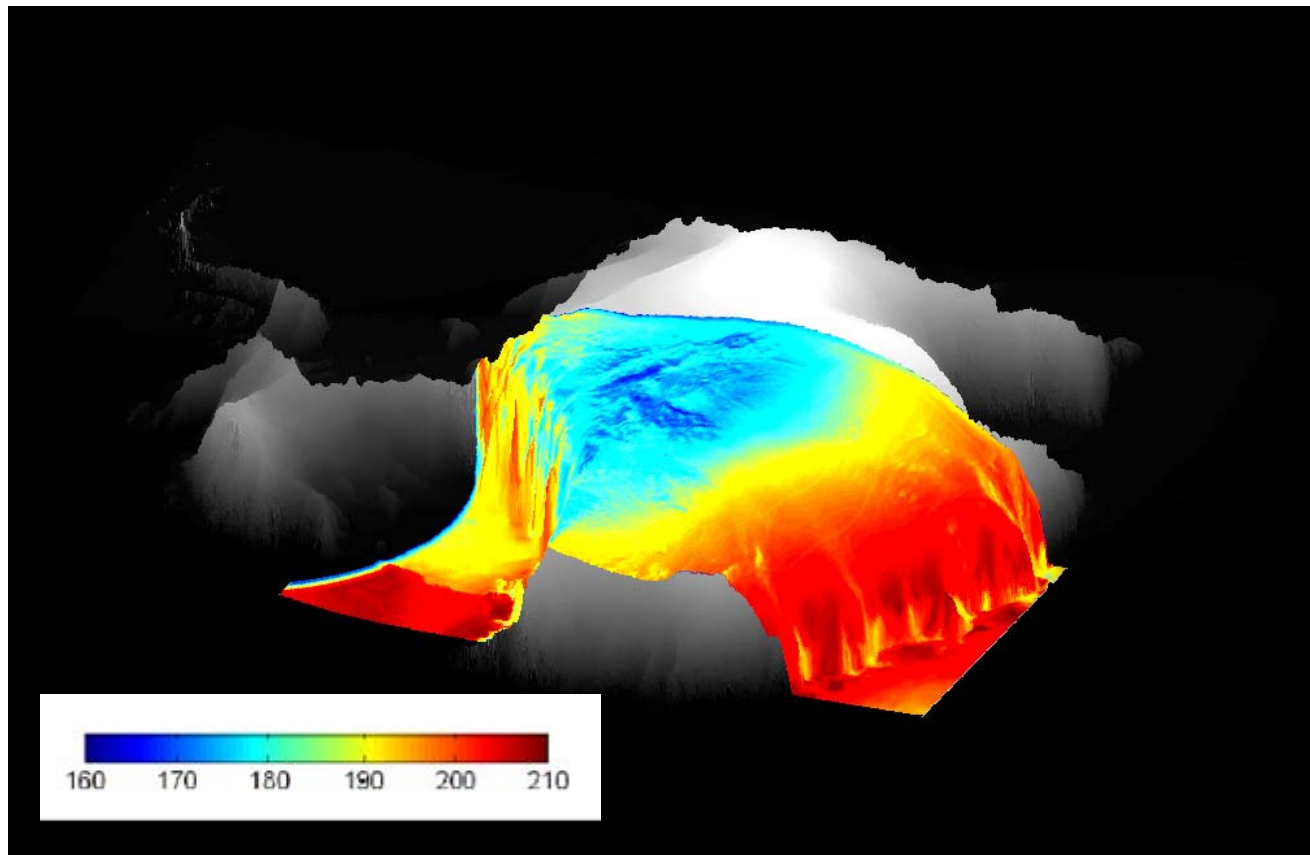


2 week Time stability

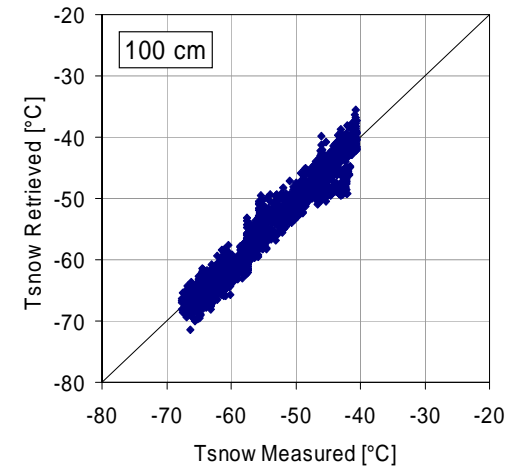
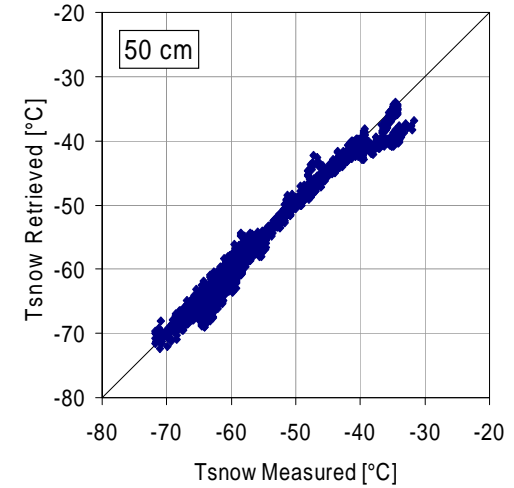
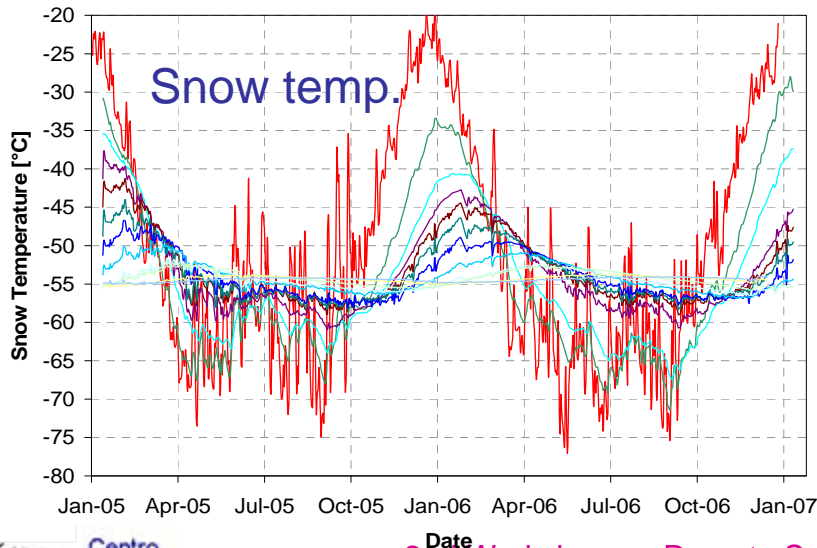
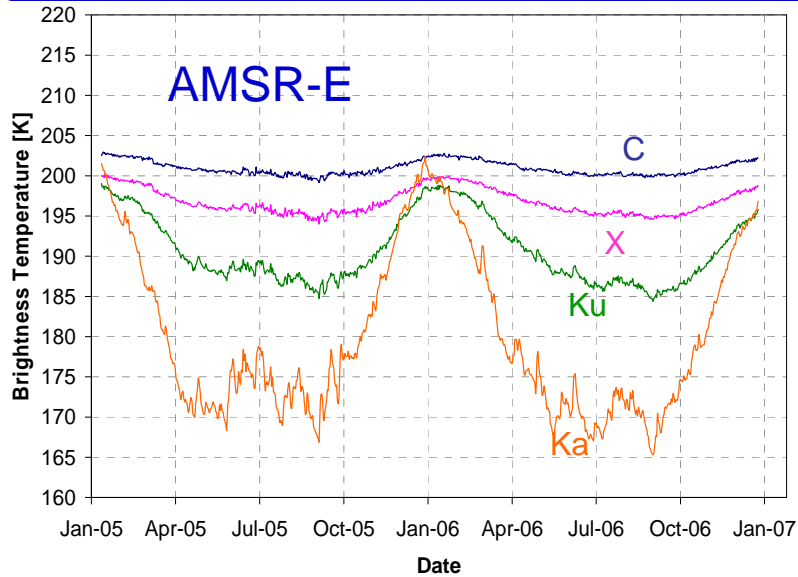
Mean = 192.32 K
Dev. st. = 0.18 K



Antarctica: Spatial variability – AMSR-E (Tb 37 GHz V - Yearly average)

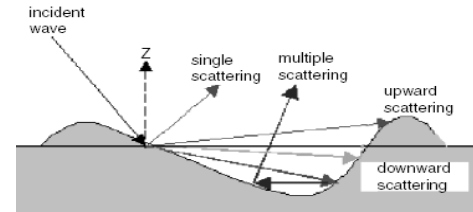


Antarctica: Temporal variability AMSR-E



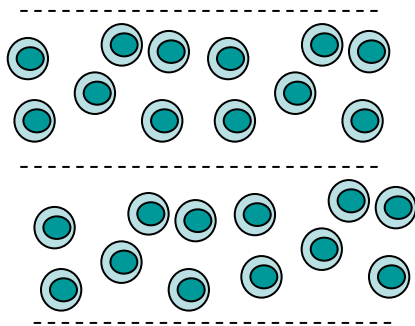
Electromagnetic modelling

Surface scattering: **soil**

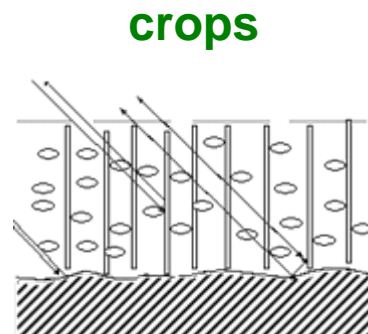


Volume scattering:

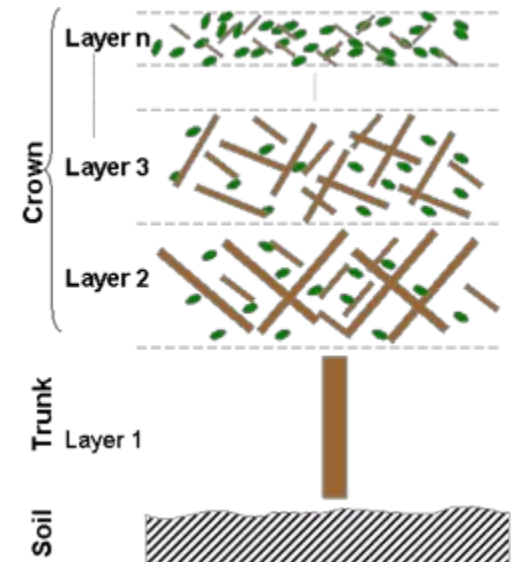
snow



vegetation

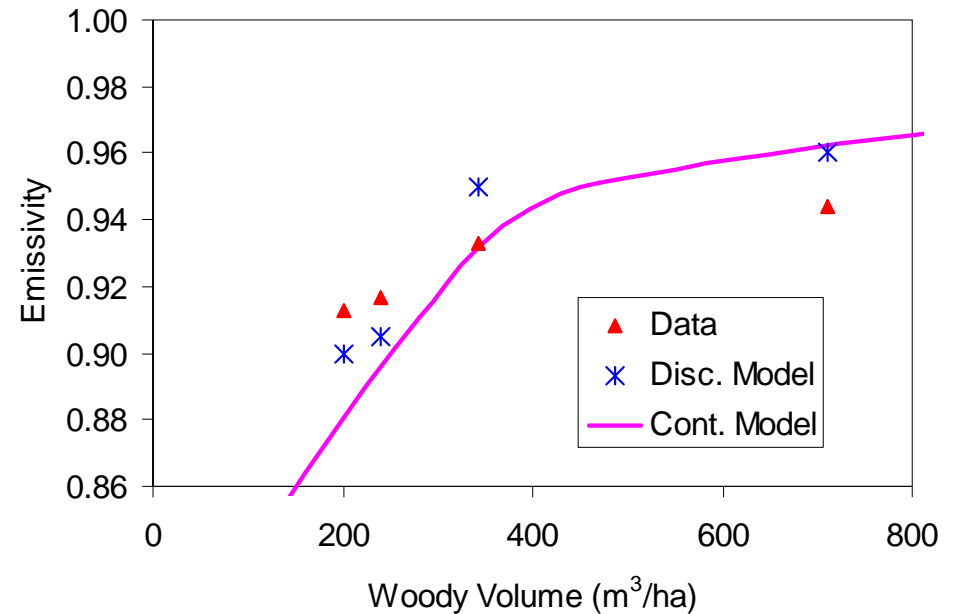
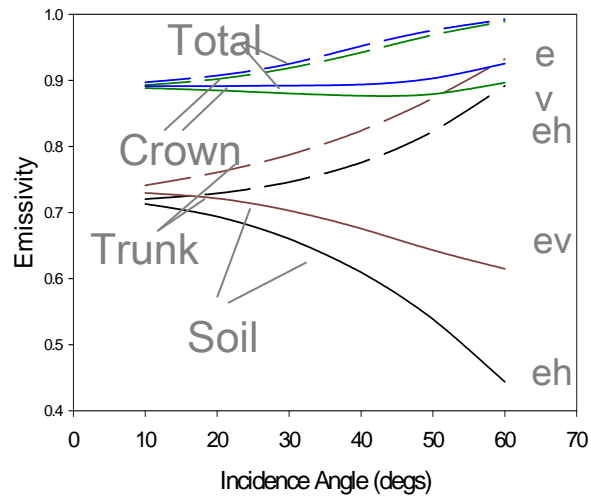


forests

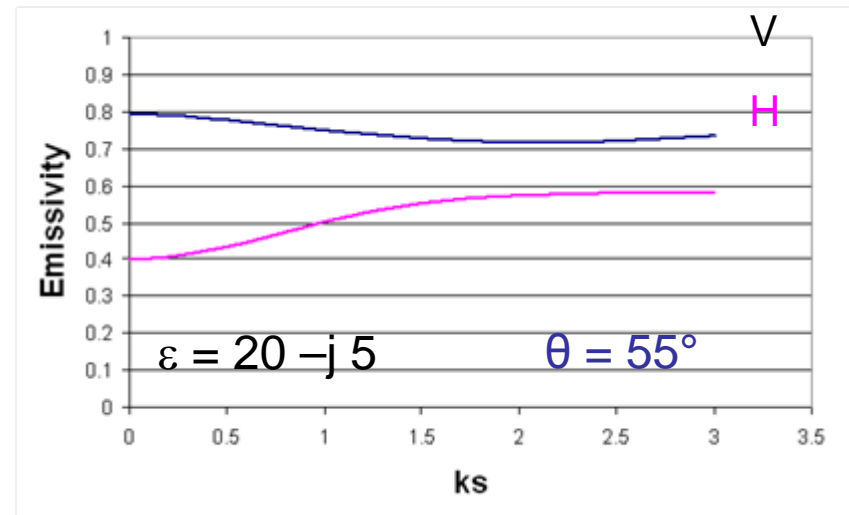
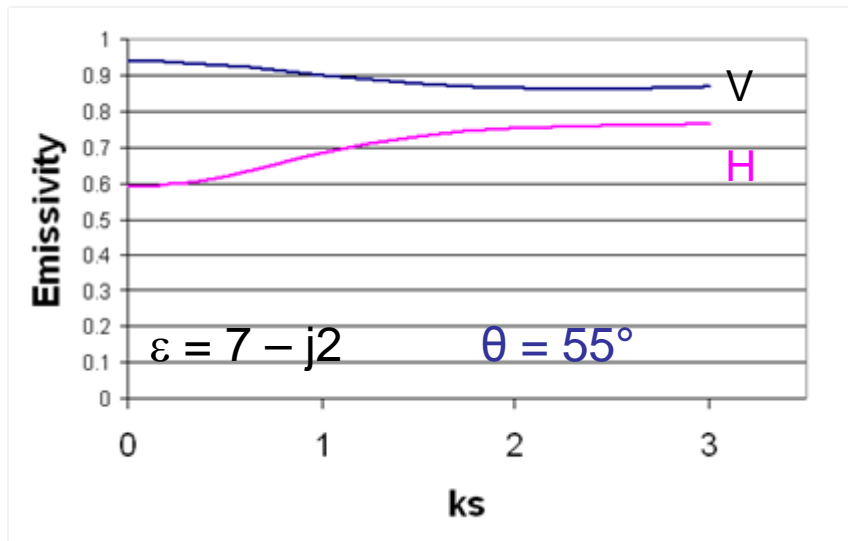


Sensitivity to forest biomass

Forest - Radiative Transfer (L-Band)

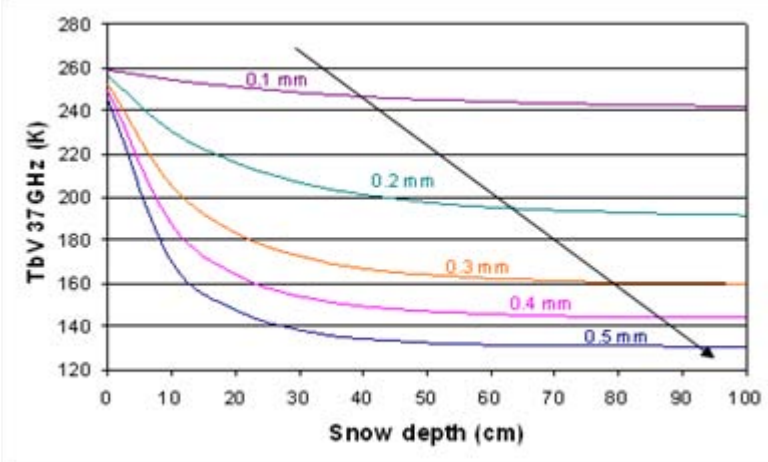
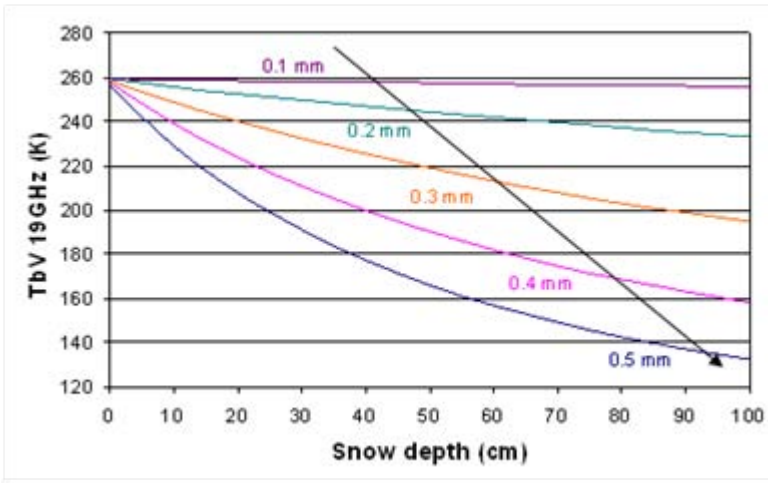


Model sensitivity to soil roughness

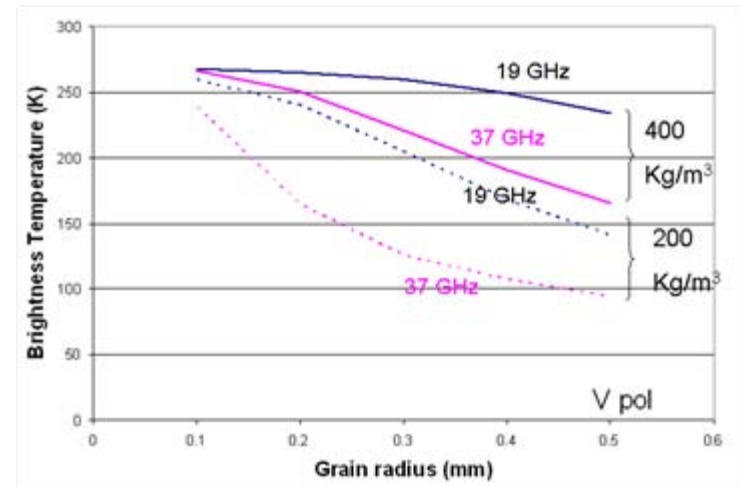


Model sensitivity to snow parameters

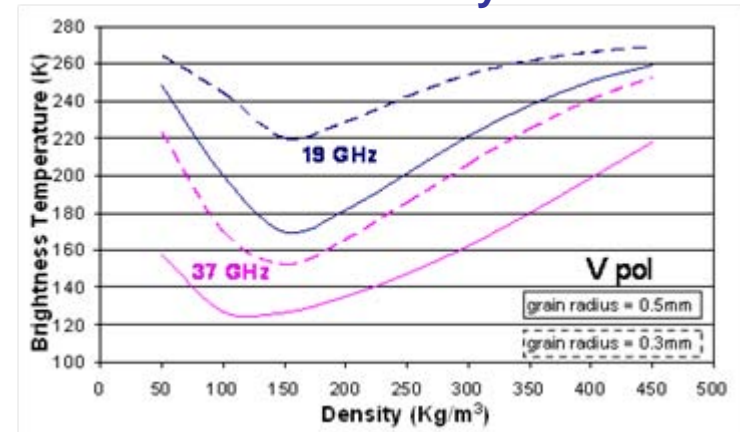
Snow depth



Grain size



Snow density



Conclusions

- ❑ Microwave emissivity of land surfaces in the frequency range 1- 40 GHz strongly depends on
 - ❖ Frequency, polarization and incidence angle of the observing sensor
 - ❖ Cover type and physical conditions
 - Bare soil: moisture, surface roughness
 - Vegetation: crop/forest type, biomass
 - Snow: depth, density (water equivalent), wetness, grain dimension