

# **Analysis of SW spectral albedo for the ARM SGP site during RACORO**

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# Motivation

- **RPWG → SW spectral radiative transfer**
- **Immediate need: spectral albedo as input**
- **Started development of SGP Surface Spectral Albedo VAP**
- **Proposed “Routine Airborne Spectral Surface Albedo Measurements” for Cessna (aerosol profiles phased out)**
- **Flight plans and science folded into RACORO**

# SGP Surface Spectral Albedo VAP

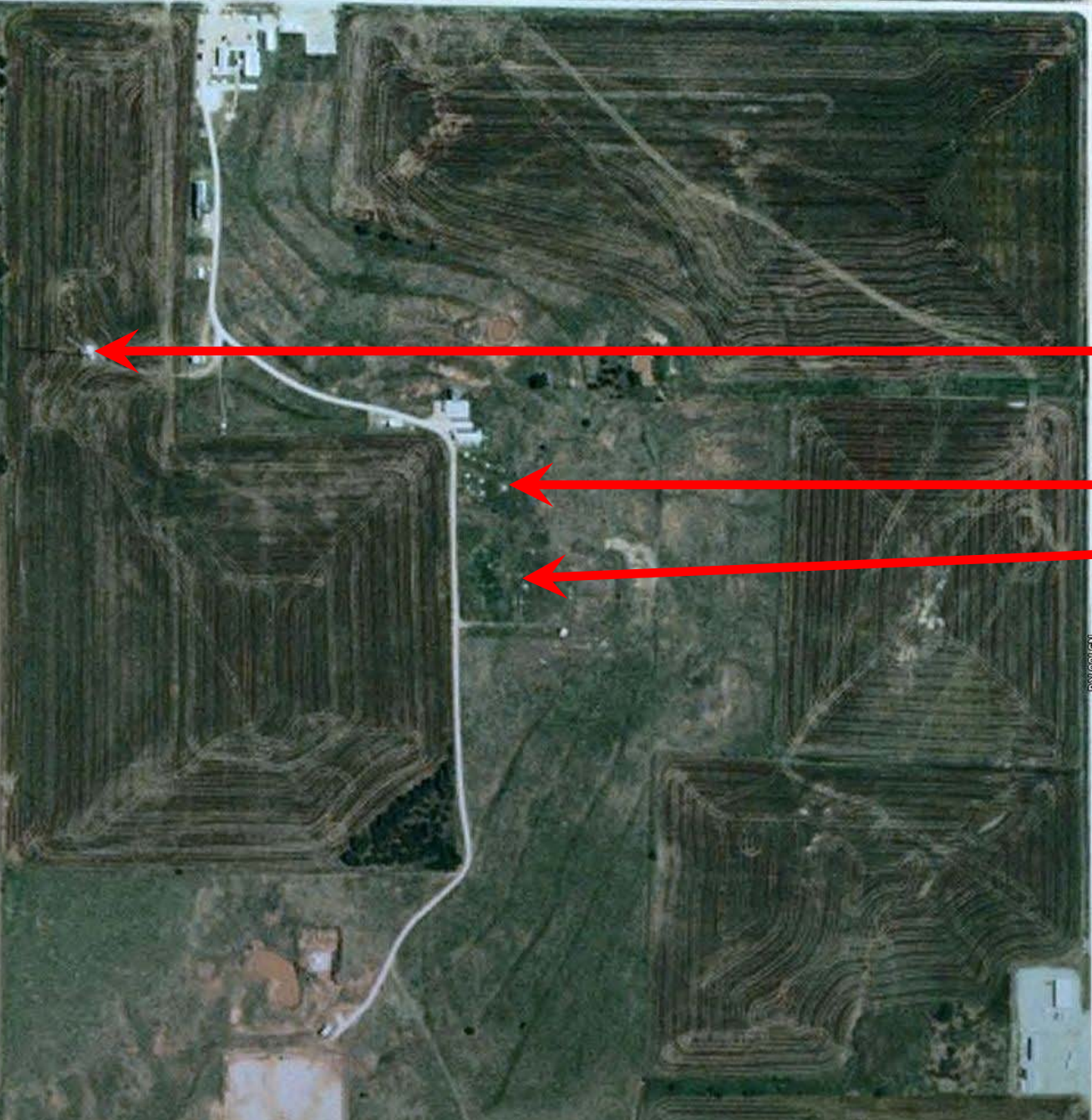
- **Downward facing MFR heads on 10m SIRS tower, and at 25m on the 60 m tower**
- **Two upward facing MFRSRs (SIRS)**
- **Data are quality assessed, then used to produce best estimates of spectral and broadband albedo for each (10m and 25m)**
- **Simple surface type identified, extrapolated to longer wavelengths**
- **<http://www.arm.gov/data/eval/18>**
- **<http://iop.archive.arm.gov/arm-iop/0eval-data/mcfarlane/surf-spec/>**

E0280 RD

# SGP Site

60 m tower  
(Corn crop)

TSI  
10 m tower  
("natural")



N 3500 RD

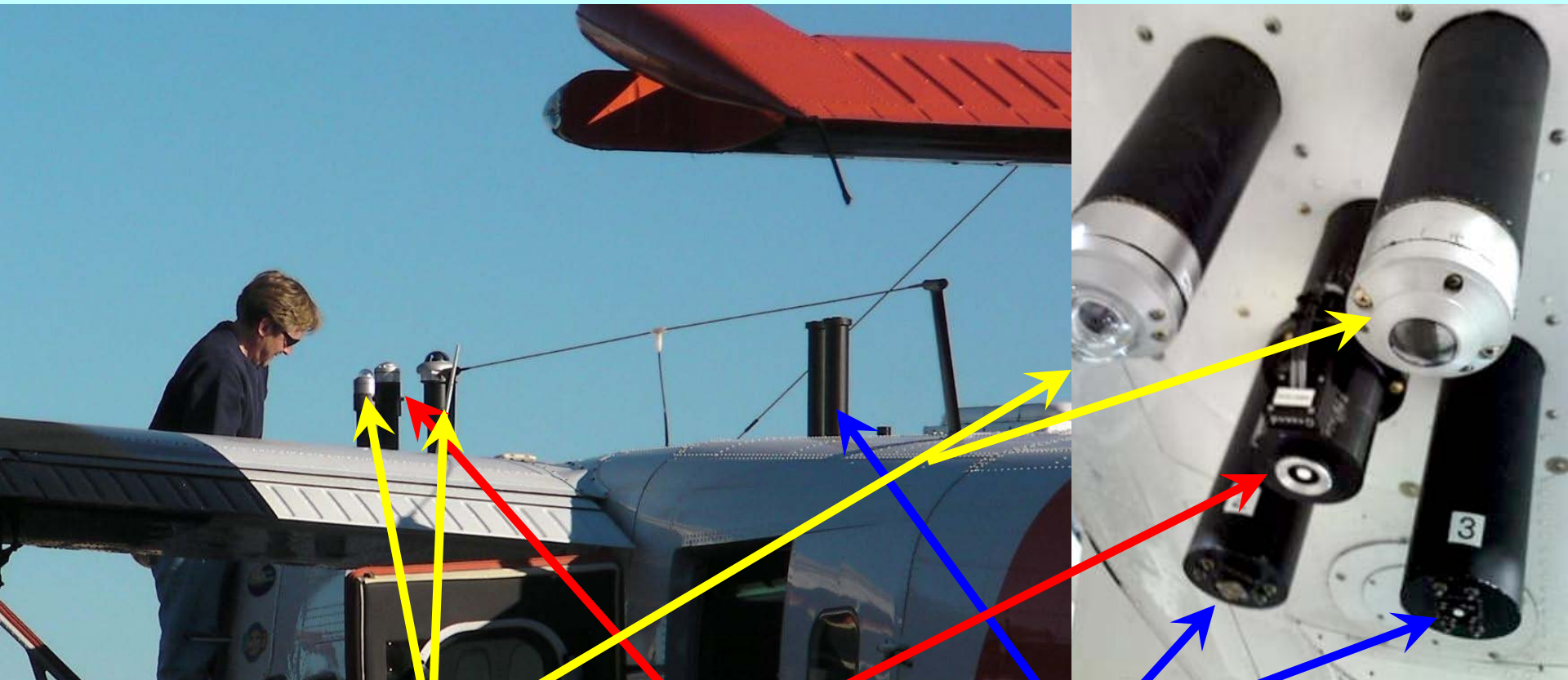
# RACORO

- **Routine AAF CLOWD Optical Radiative Observations**
- [Clouds with Low Optical Water Depths]
- **Held January – June, 2009**
- **Included low-level “albedo” flights**
- **Both broadband and spectral SW measurements**
- **<http://campaign.arm.gov/racoro/>**

# **RACORO SW Radiometers**

- **Up- and down-facing modified CM-22 broadband hemispheric SW**
- **Upward facing SPN-1 Total/Diffuse broadband hemispheric SW**
- **Up- and down-facing MFR spectral hemispheric (140° FOV) SW**
  - **415, 500, 615, 870, 940, 1625 nm channels**
- **Up- and down-facing HydroRad spectral hemispheric and NFOV SW**
  - **350-850nm, 0.3nm res, 3 FOV one channel**

# RACORO Radiometers



**Broadband**

**MFR**

**HydroRad**

# Albedo Flight Pattern

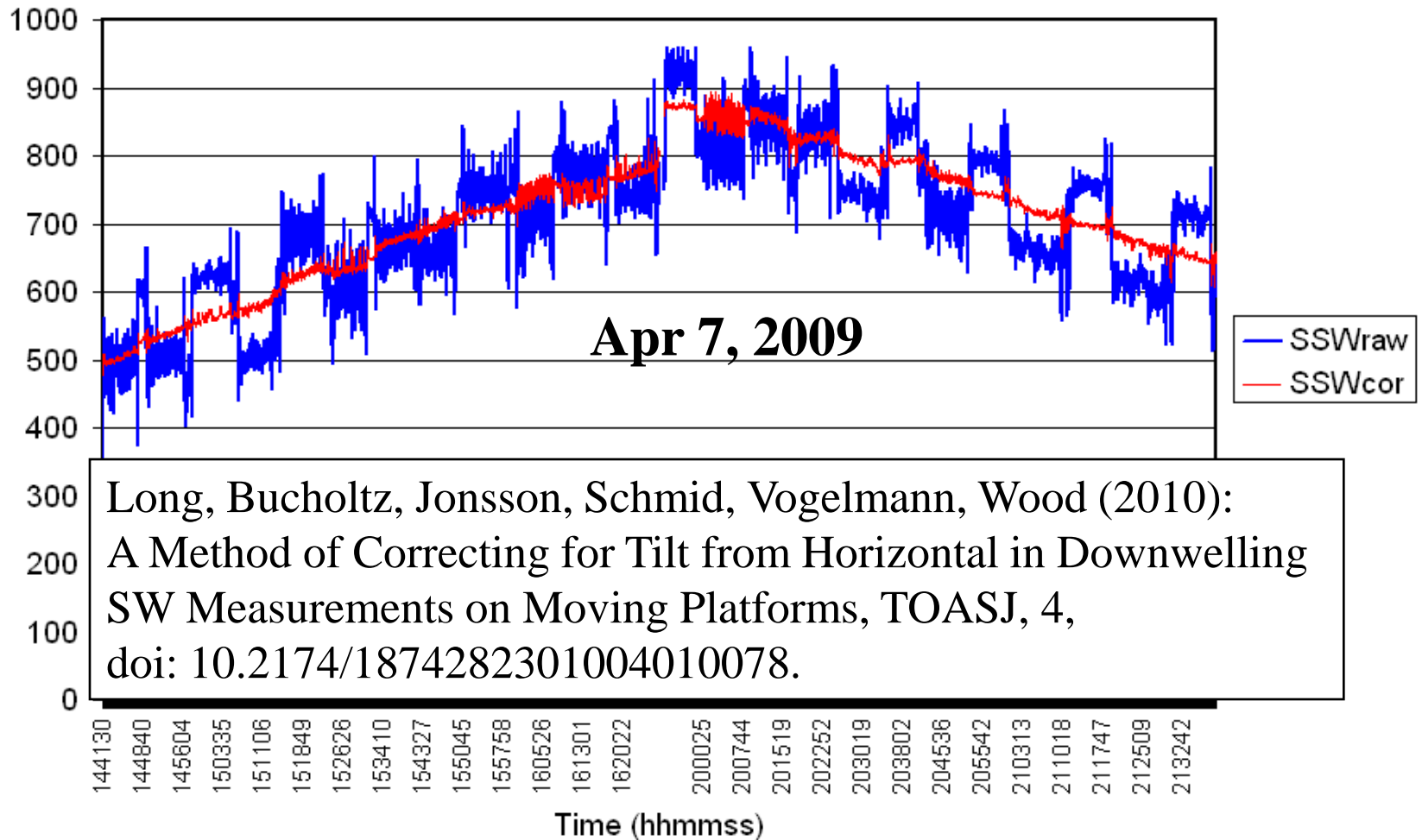
~10-12 km radius  
Around SGP CF





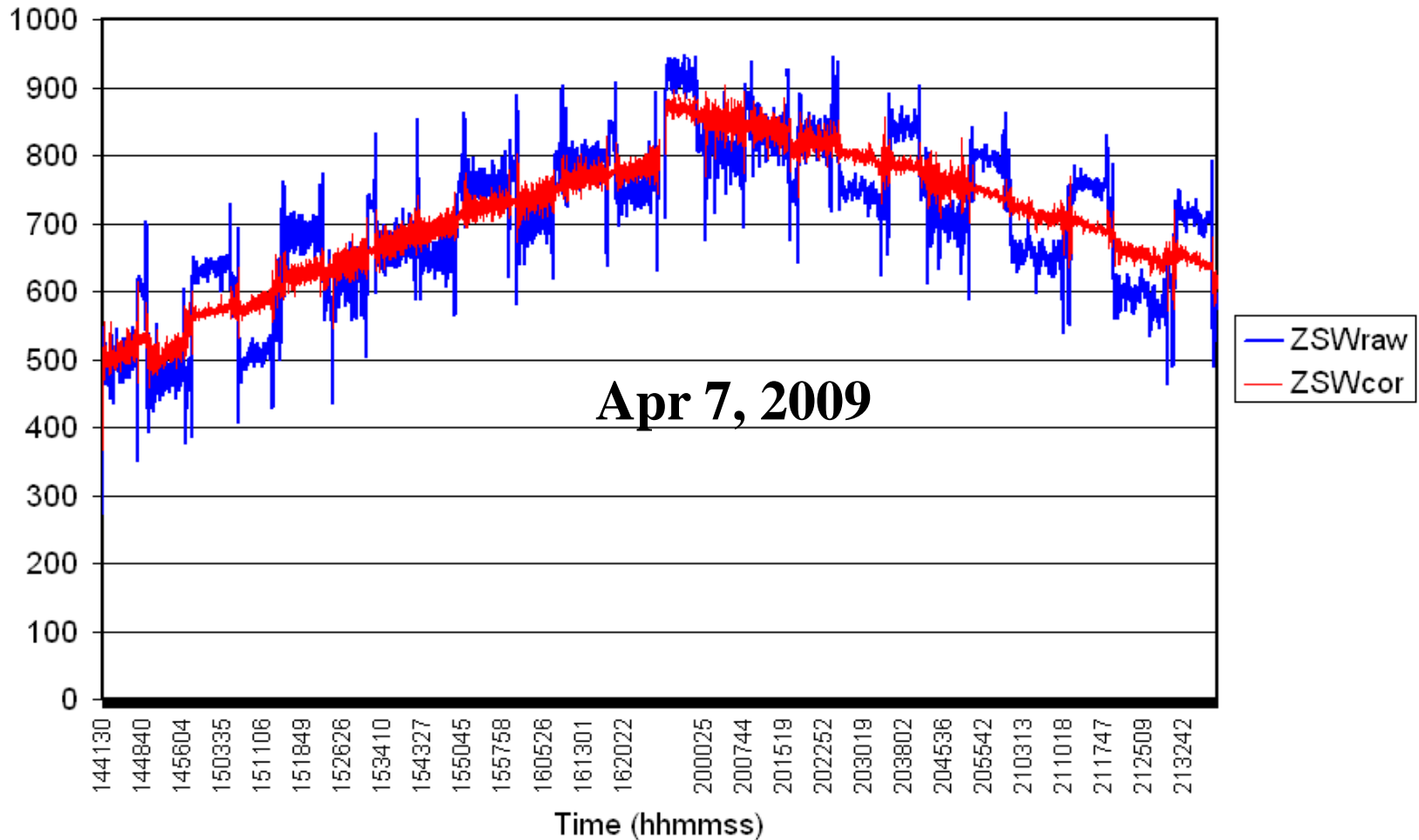
# Tilt Correction SPN-1 (BB)

Raw and Tilt Corrected Zenith SPN-1 BB SW Apr 7, 2009



# Tilt Correction CM-22 (BB)

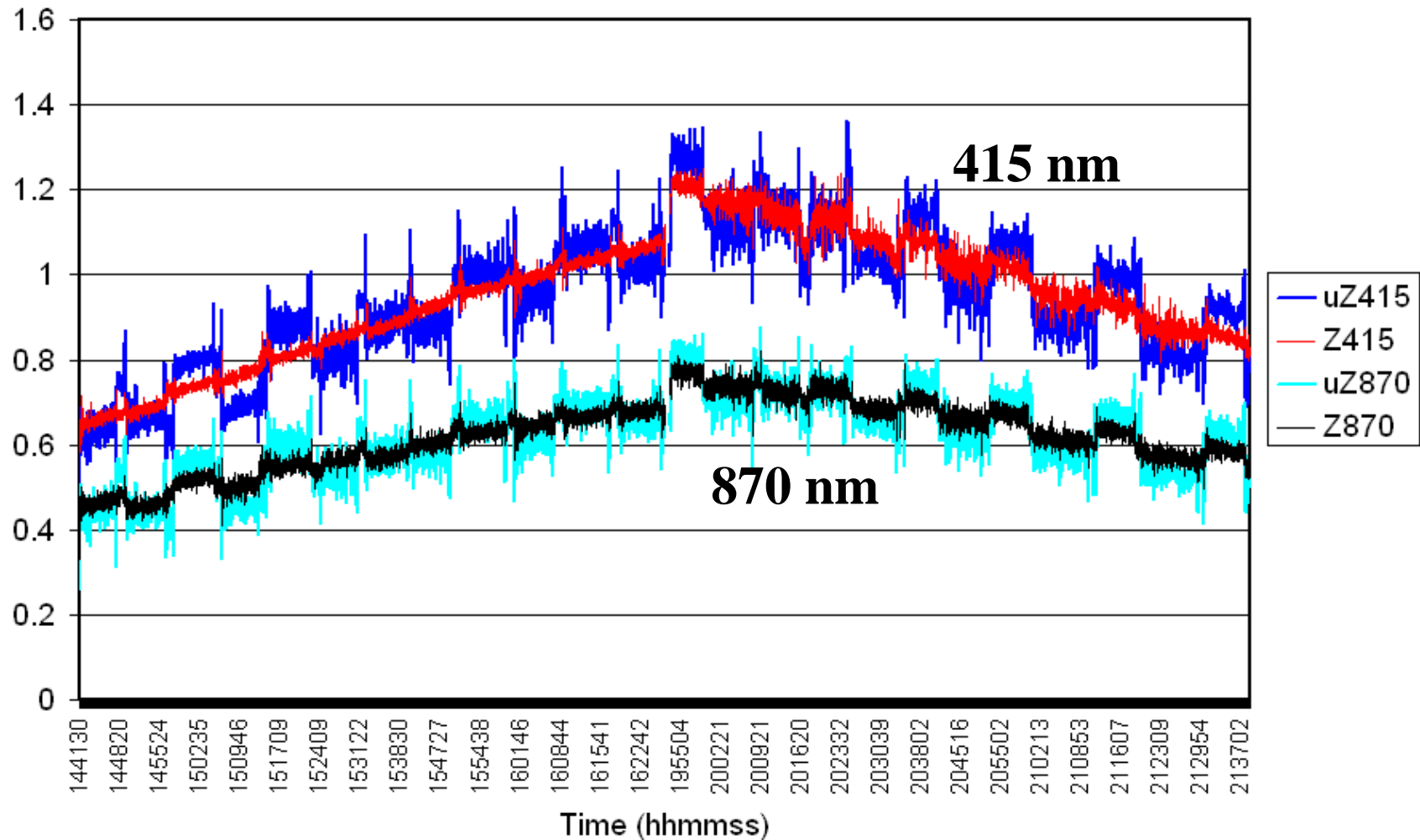
Raw and Tilt Corrected Zenith CM-22 BB SW Apr 7, 2009



# Tilt Correction Spectral

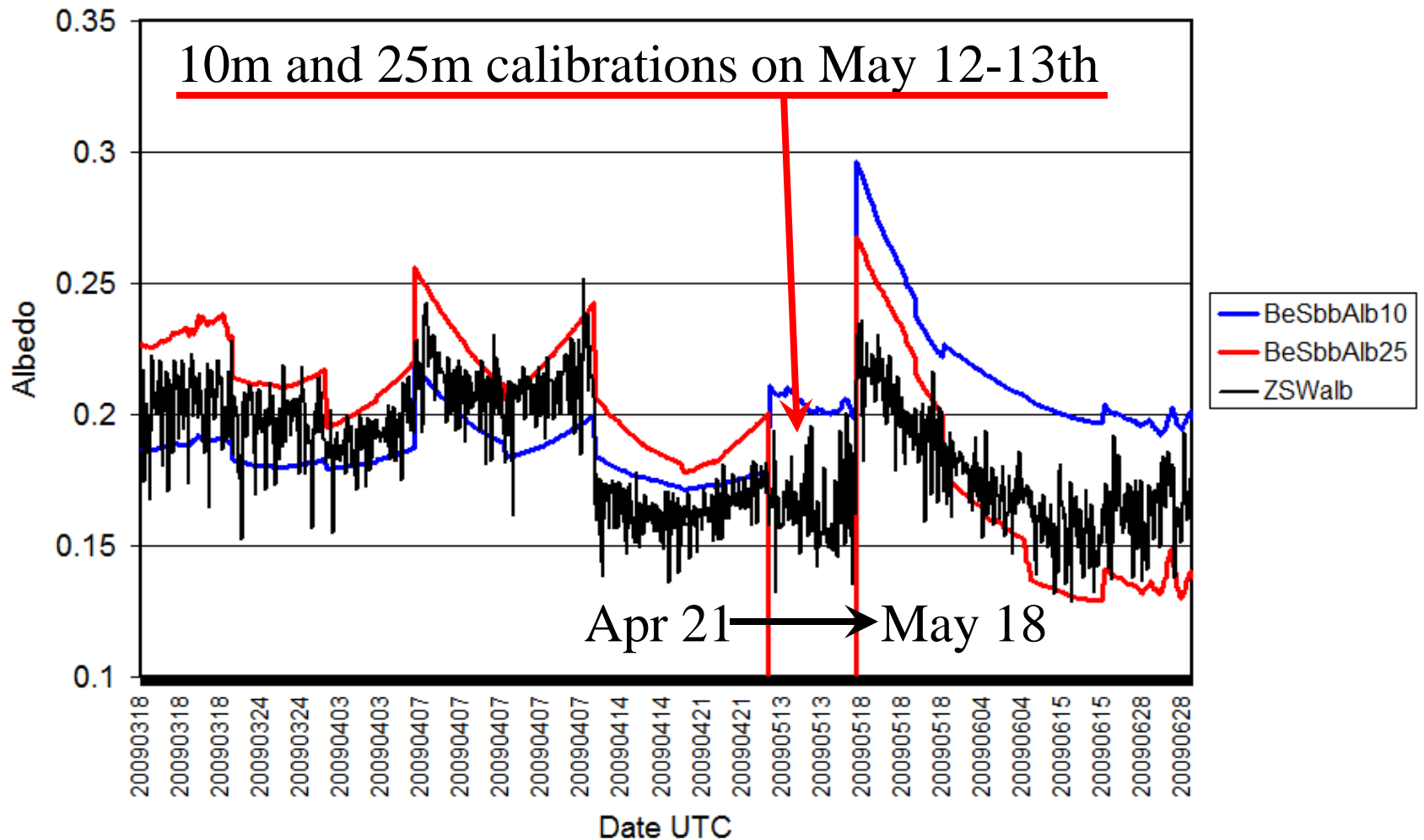
Raw and Tilt Adjusted Zenith Spectral 415 & 870 nm

Apr 7, 2009

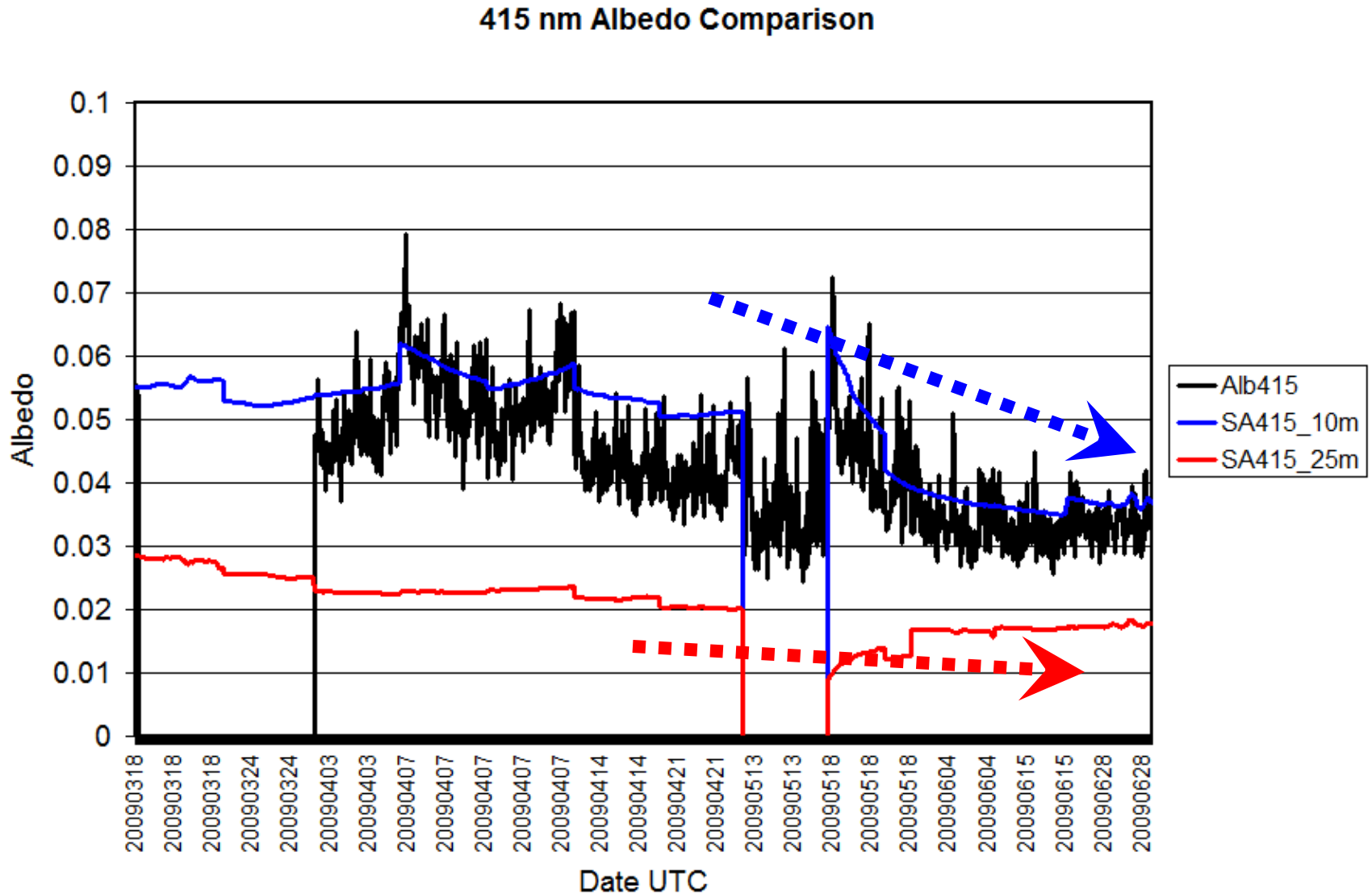


# Albedo Comparison (BB)

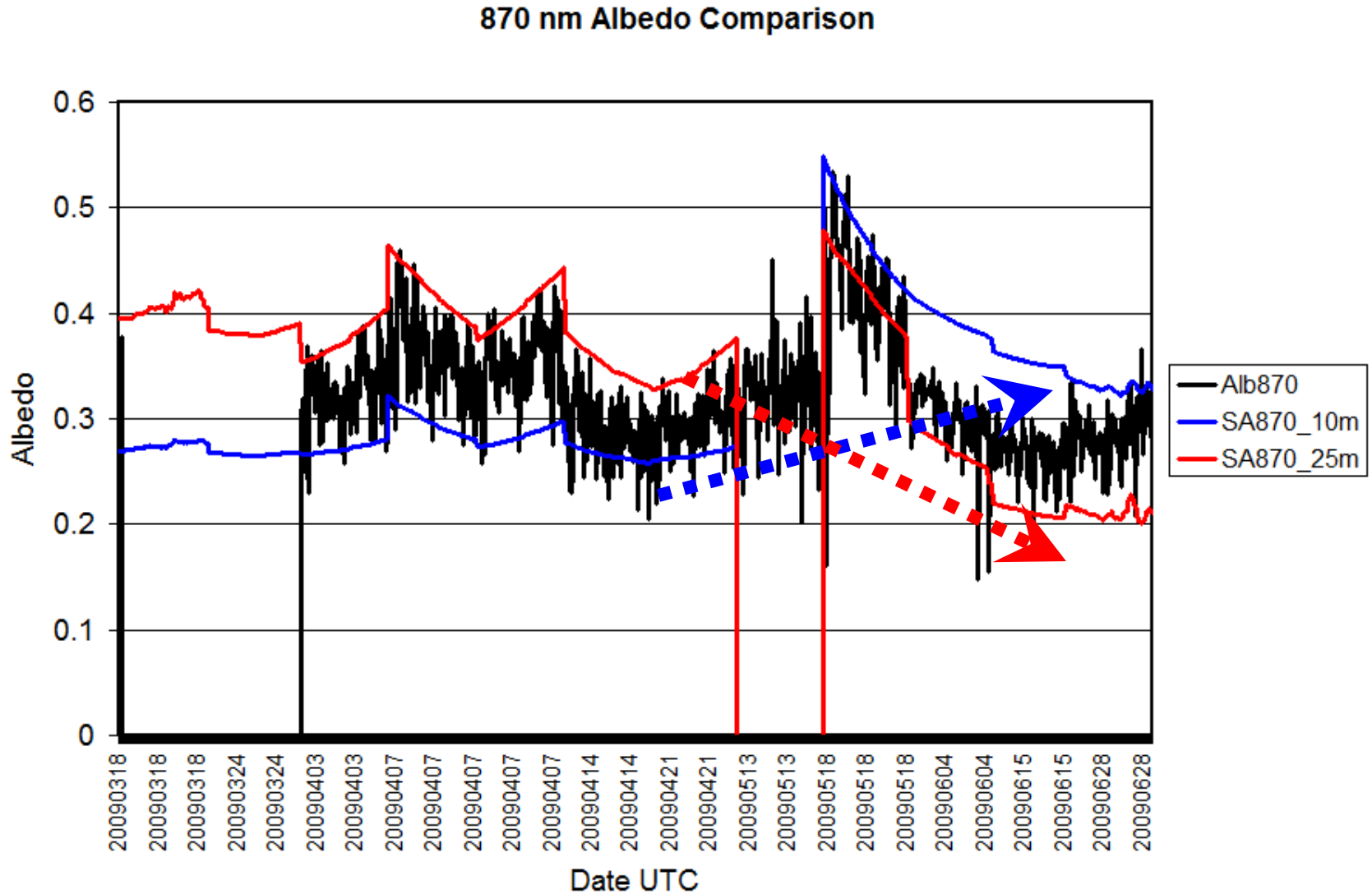
Broadband Albedo Comparison



# 415 nm Albedo Comparison



# 870 nm Albedo Comparison



E0280 RD

# SGP Site

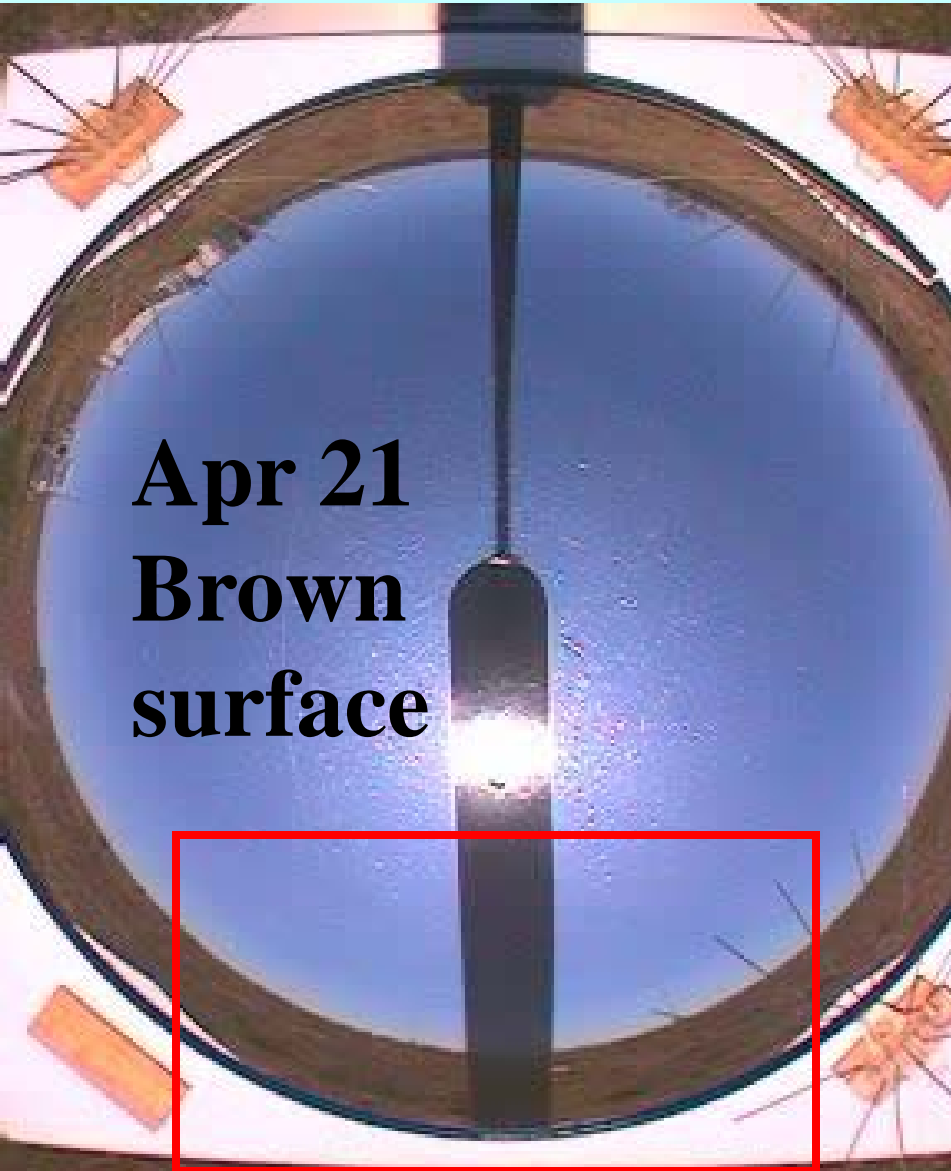
TSI  
10 m tower  
("natural")

10 m  
Tower  
South  
of TSI



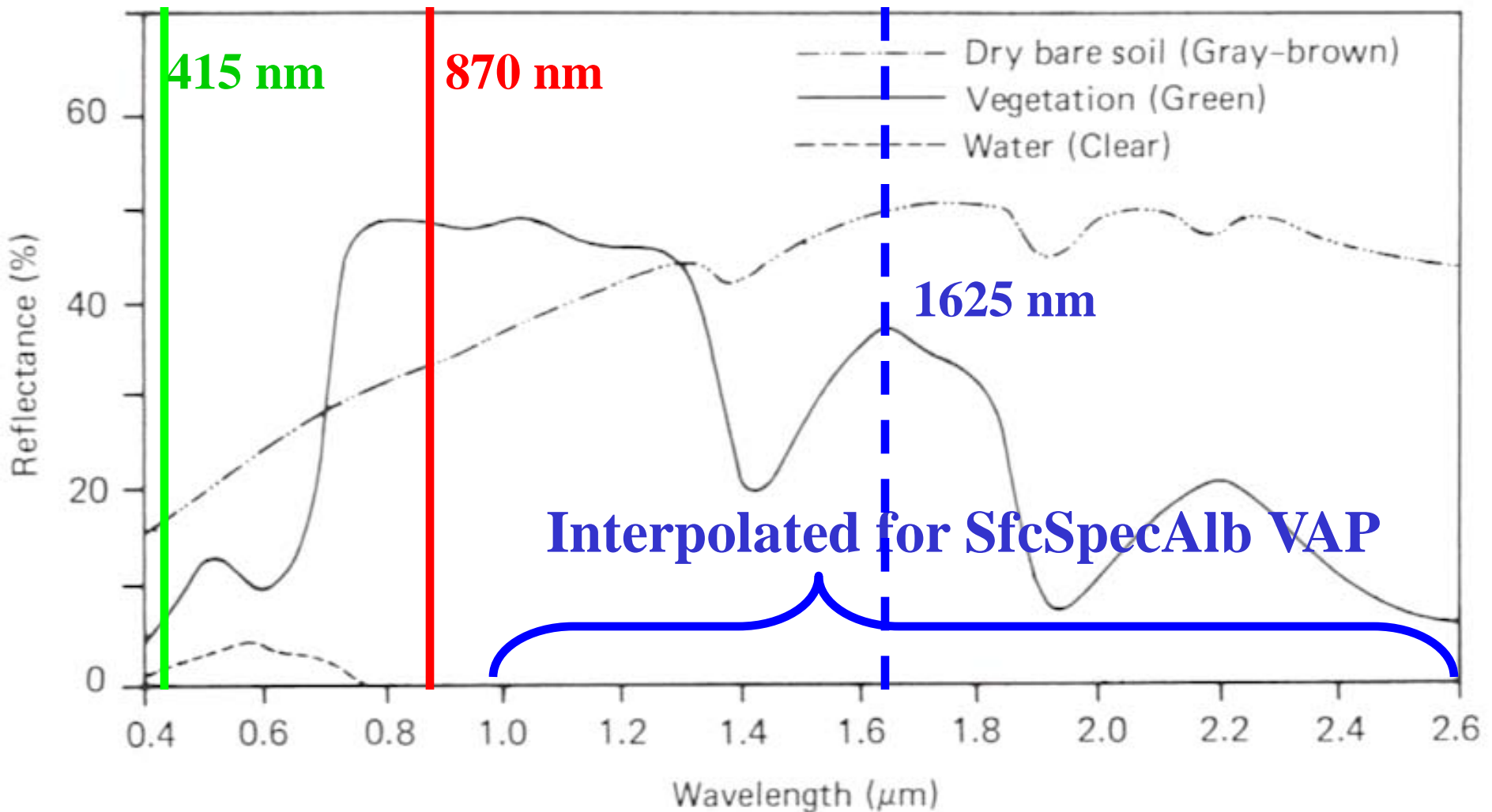
N 3100 RD

# SGP CF Greening

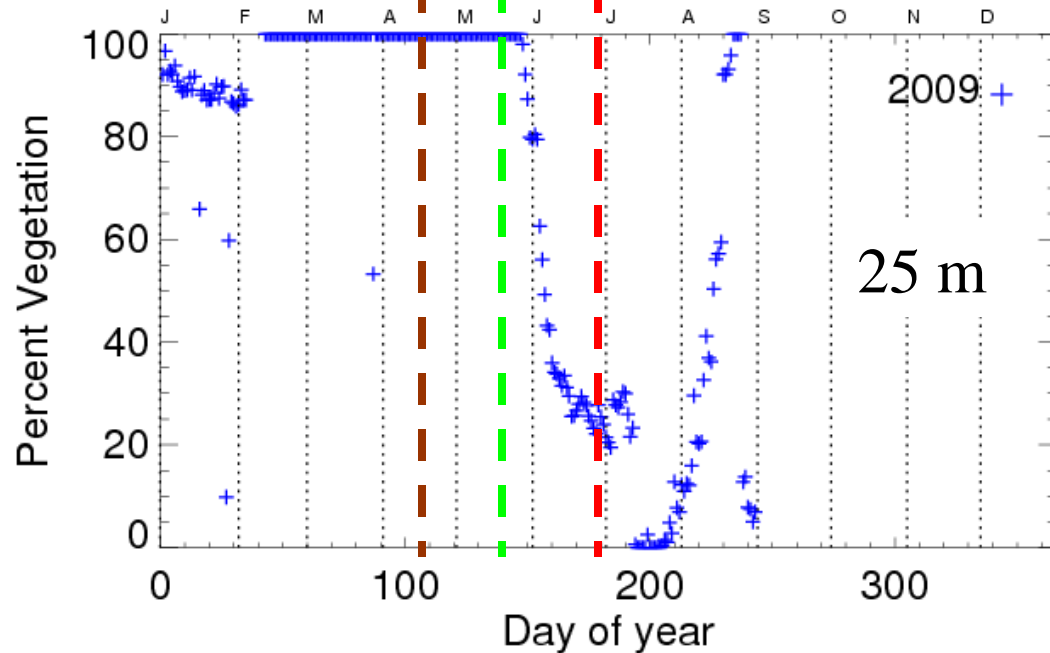
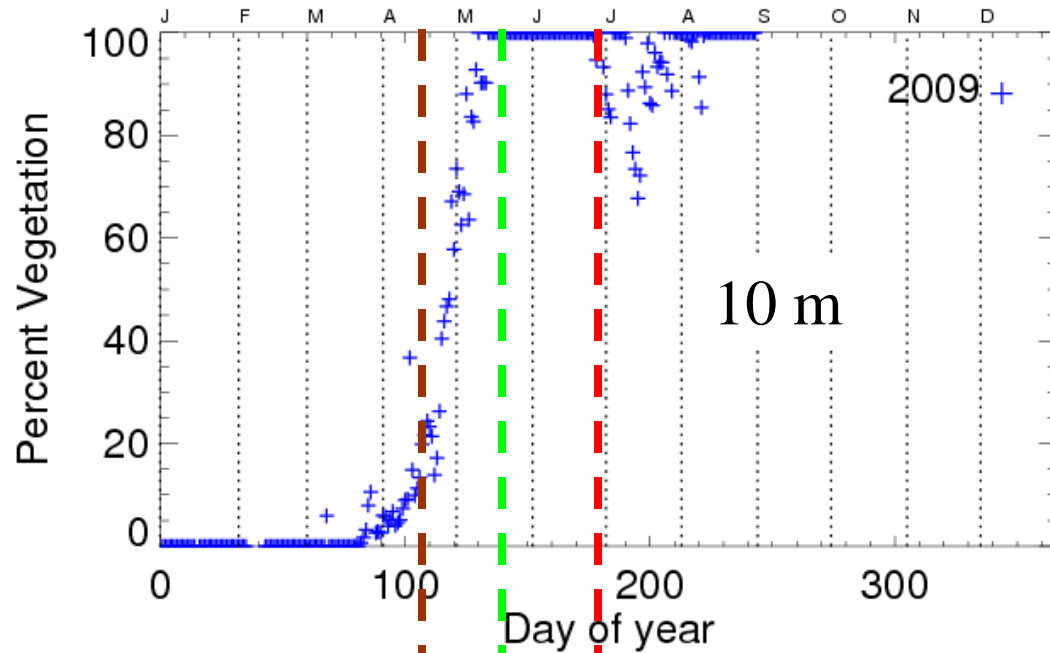




# Vegetation and Soil Spectrum



# SfcSpecAlb Surface Type



**Apr 21,**  
**May 18,**  
**Last flight**  
**June 28**

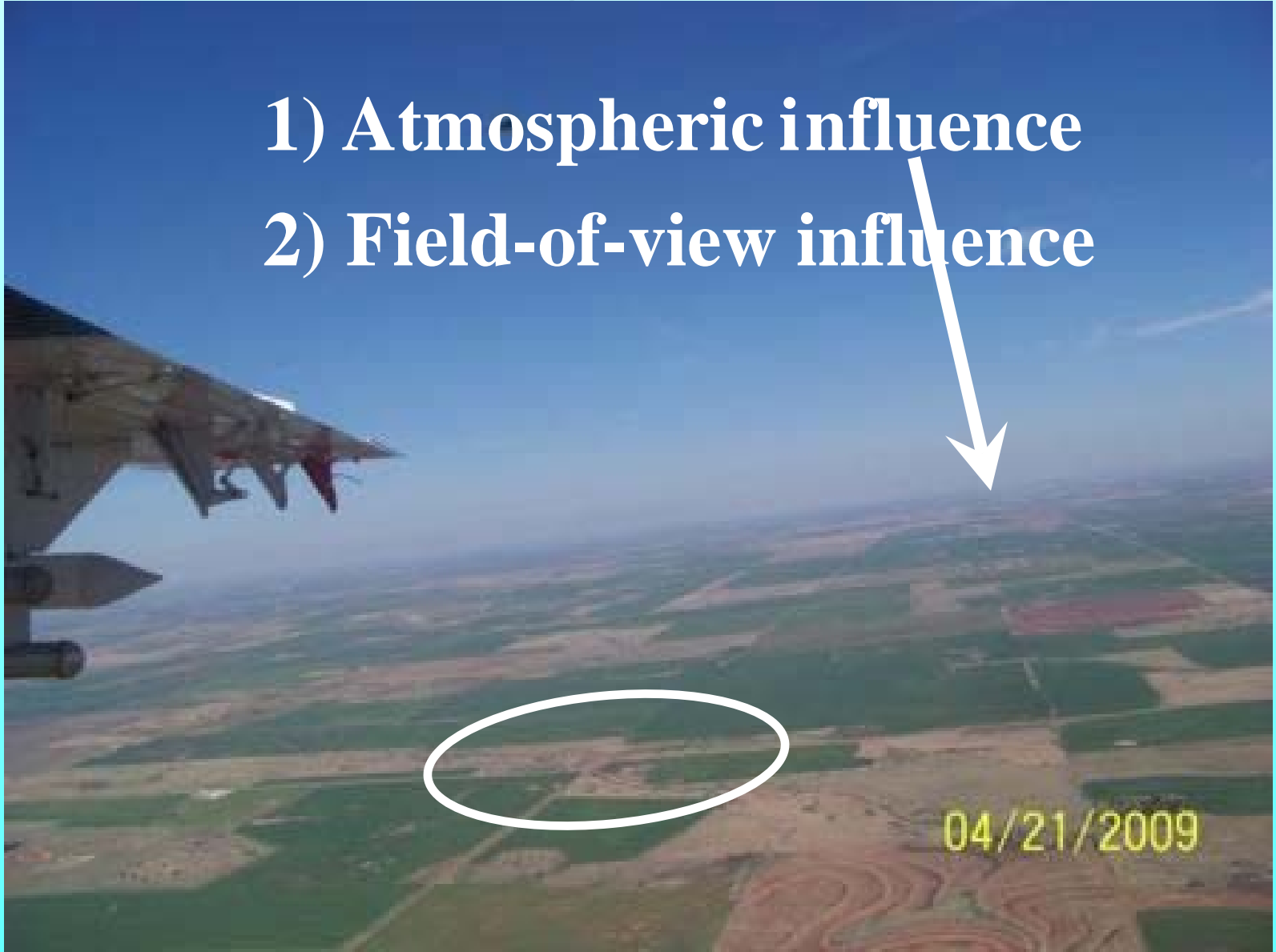


# Albedo Height Dependence

- 1) Atmospheric influence
- 2) Field-of-view influence



04/21/2009



# Summary

- **RACORO albedo data variable, nominally agrees with SGP SfcSpecAlb data, with some differences**
- **If we are to pursue SW spectral studies:**
  - **Is the SGP the best place?**
  - **Need periodic spectral albedo surveys**
    - **Cessna already has downward-facing MFR**
    - **Add upward-facing MFR and SPN-1**
  - **Install digital cameras on 25m and 10m towers to document surface**
  - **Add 1625 nm channel to MFRs and MFRSRs**
    - **Both SGP and NSA → TWP? AMF?**