GOES-R Risk Reduction Project:

# Predicting Convective Initiation 1-6 Hours Prior to Occurrence

Detecting low-level water vapor convergence before clouds form

Dan Lindsey, NOAA/NESDIS/STAR/Regional and Mesoscale Meteorology Branch, Fort Collins, Colorado

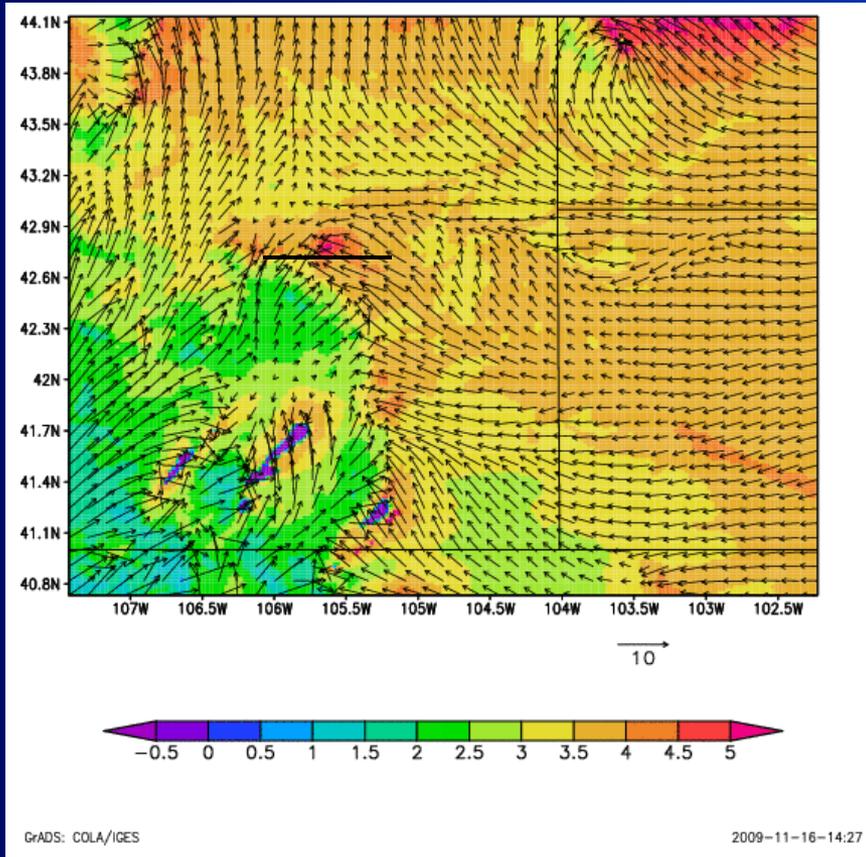Dan Bikos and Louie Grasso, CIRA, Fort Collins, Colorado

Other project collaborators: John Mecikalski, John Walker, Lori Schultz, Chris Velden, Steve Wanzong, Bob Rabin, Brian Vant-Hull
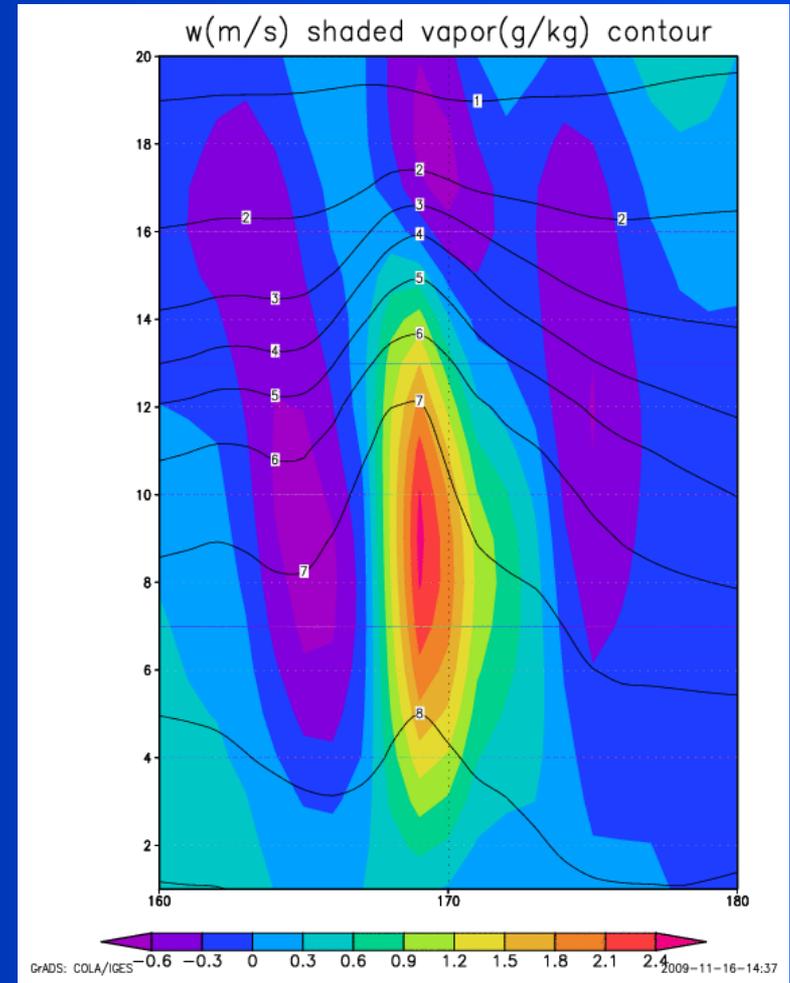
Model Simulations – 27 June 2005

(10.35 – 12.3) 27 June 2005
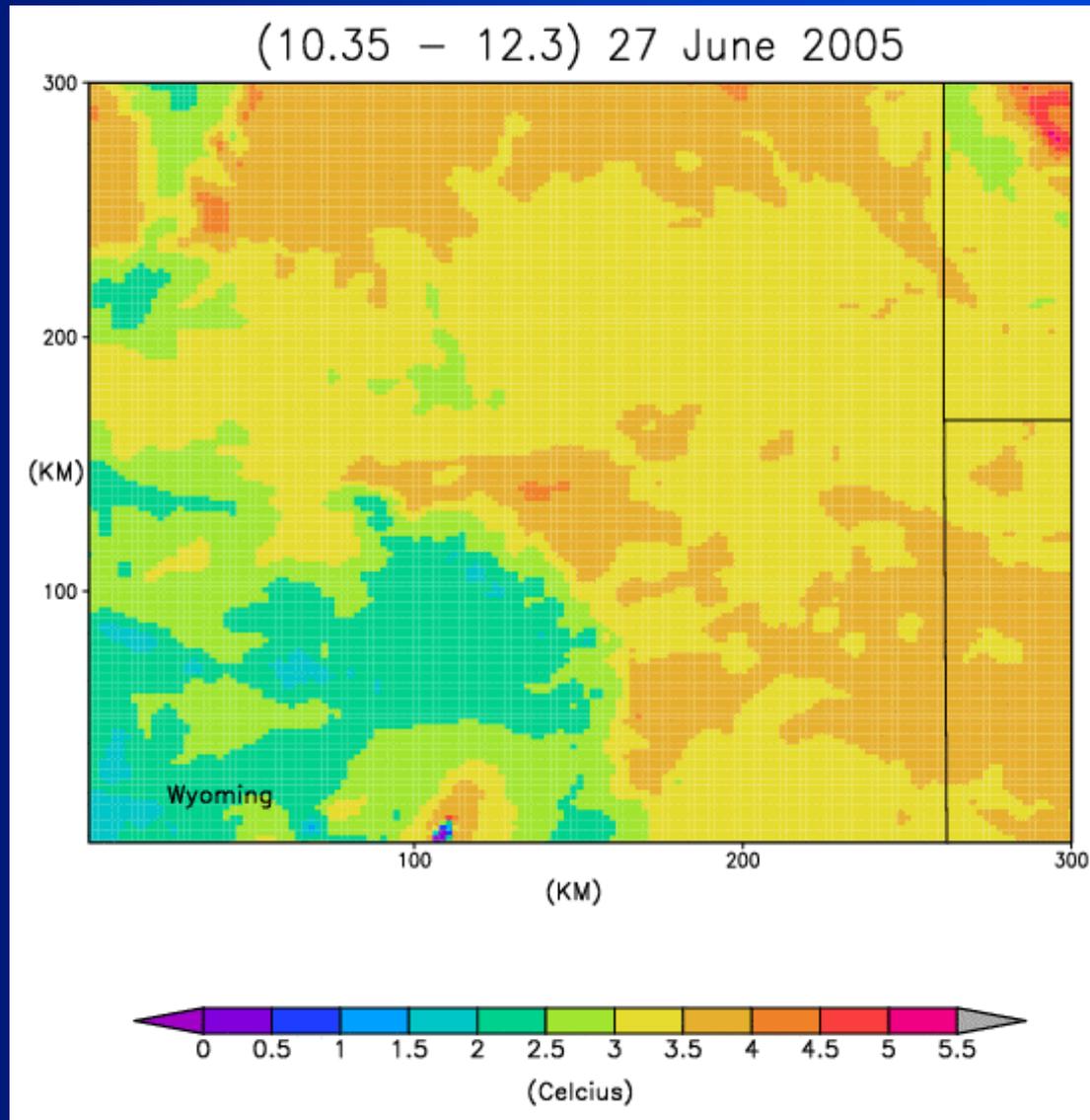
Simulated 10.35 - 12.3 μm (purple means a cloud has formed)

Model Simulations – 27 June 2005

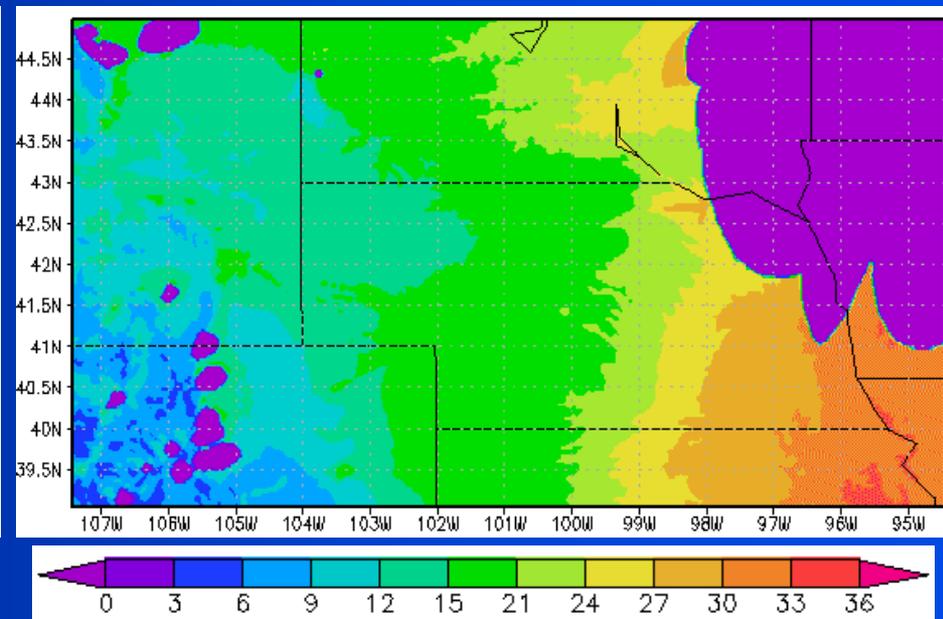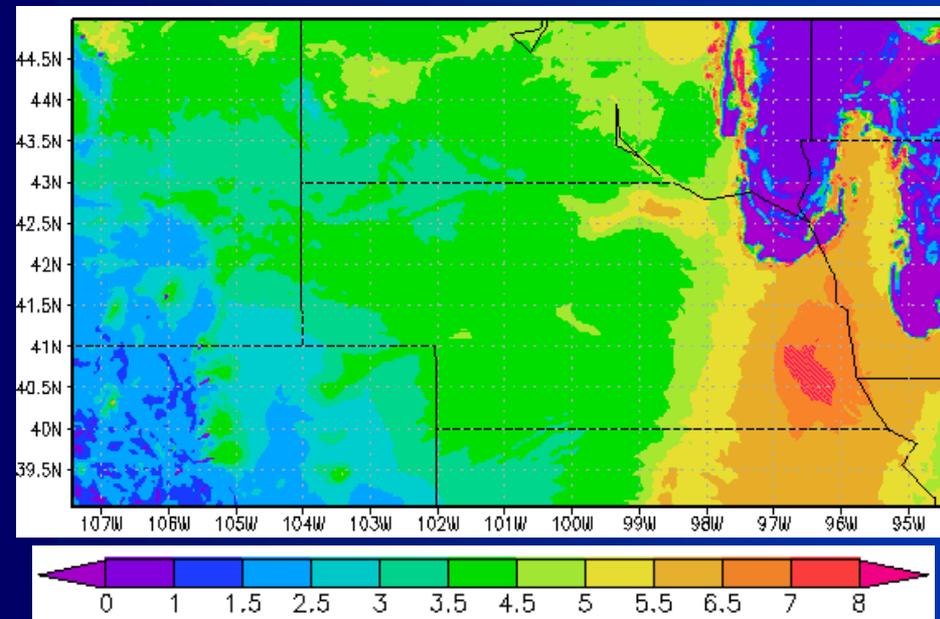**Surface Wind Vectors and 10.35-12.3 BTD**

Vertical cross-section across black line, with water vapor mixing ratio (g/kg, contours) and vertical velocity (colors)
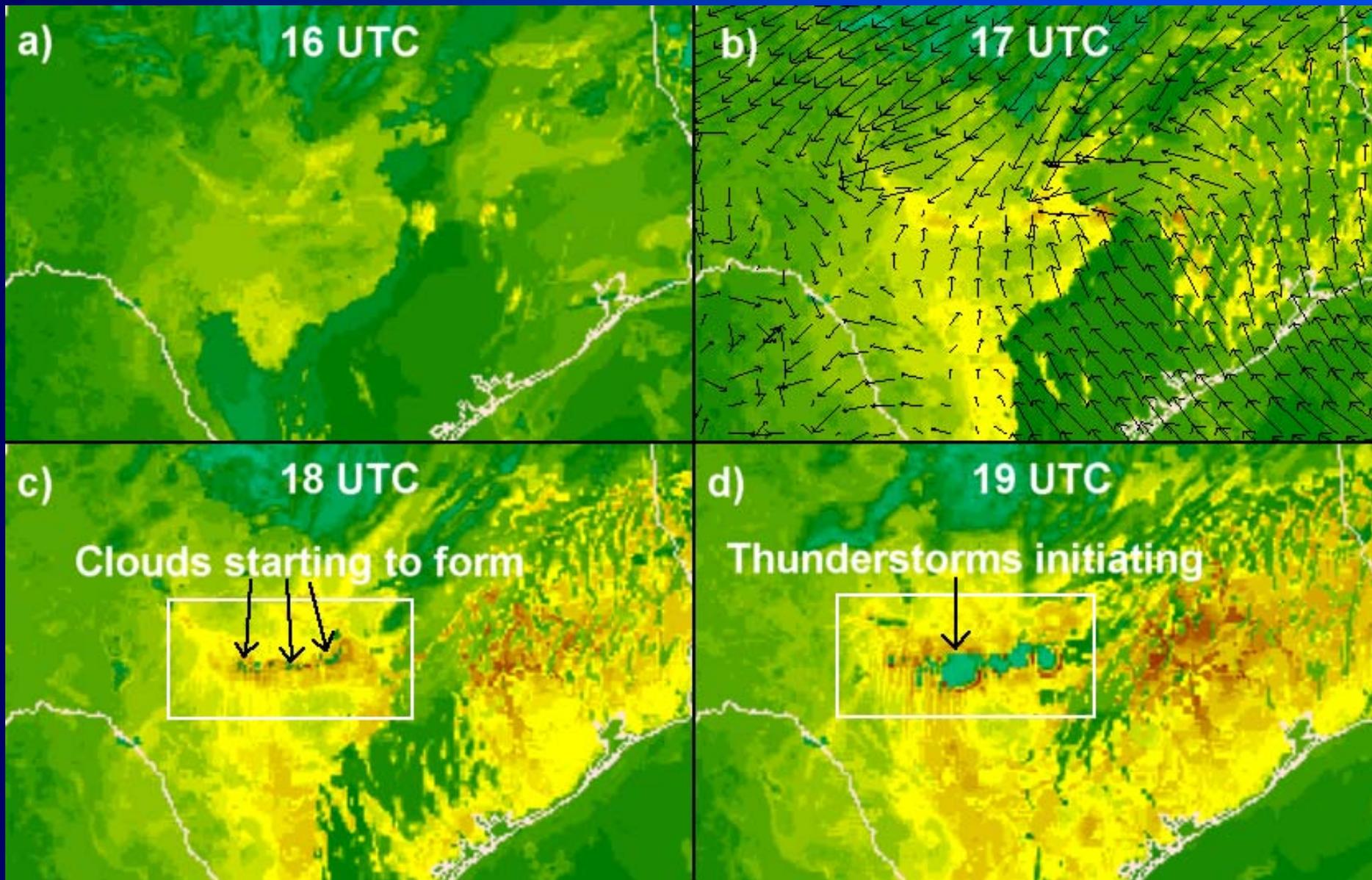
Model Simulations – 27 June 2005

Simulated 10.35 -12.3 μm (purple color means a cloud has formed)
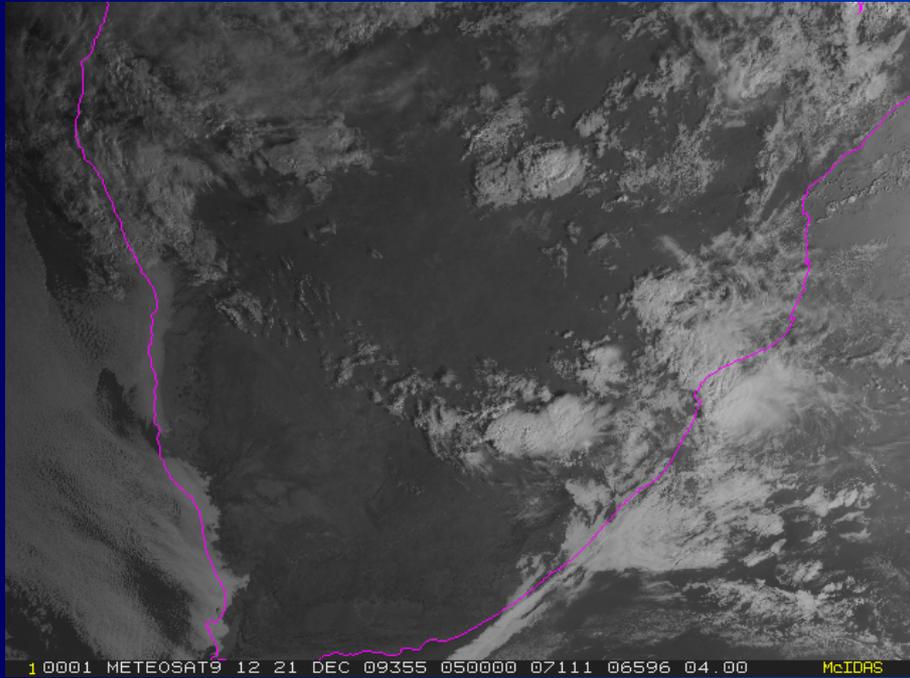
Model-derived 0-3 km Precipitable Water (mm)
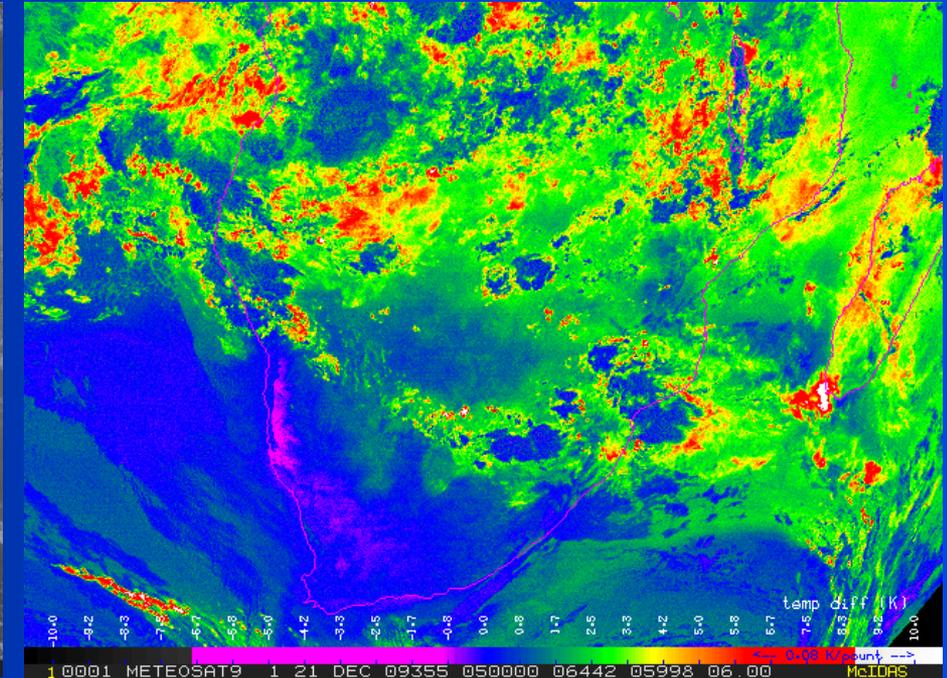
WRF-ARF 10.35-12.3 µm – 20 Apr 2011

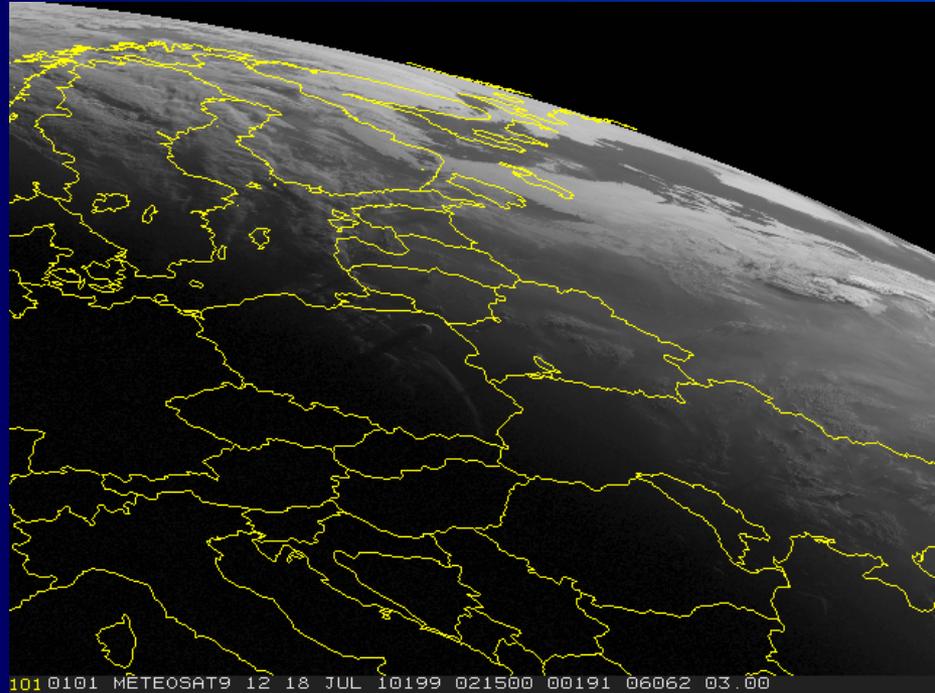# Meteosat 2nd Generation Observations

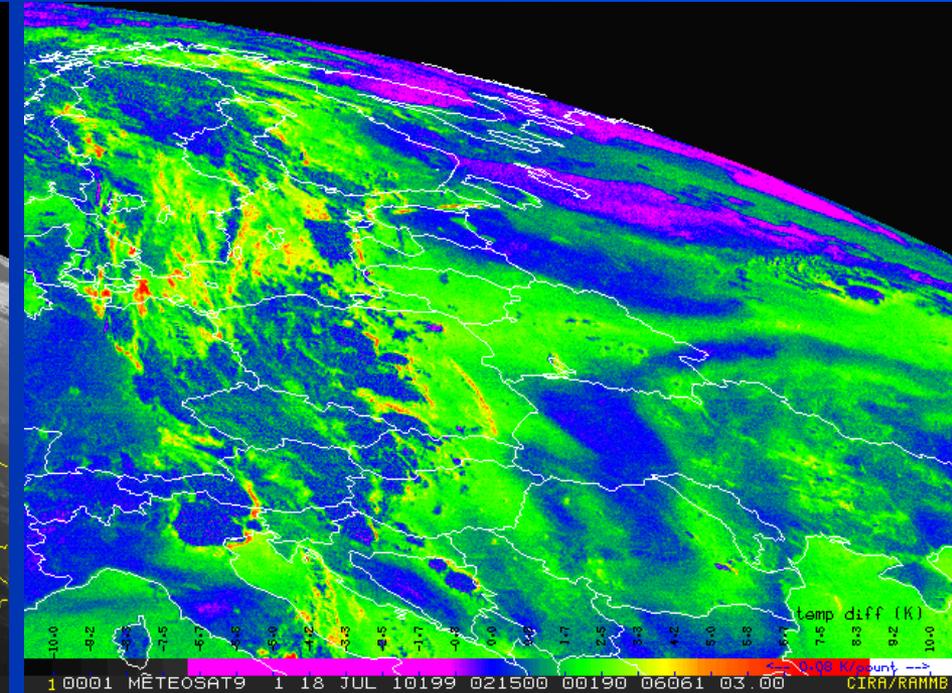## Southern Africa – 21 Dec. 2009

MSG High Res Vis Loop

MSG 10.8-12.0 μm Loop

Meteosat 2nd Generation Observations

Eastern Europe – 18 July 2010


MSG High Res Vis Loop

MSG 10.8-12.0 µm Loop

Summary of Split Window Difference

- Model simulations suggest that the split window difference from GOES-R can be used to locate regions of low-level moisture convergence

- This field can provide good lead times for cumulus cloud and eventually storm formation

- Limitations/complications include intervening cloud cover, a dependence on the temperature lapse rate, and complex terrain

- Examples from MSG show promise in corroborating model simulations

- Future work includes looking at more MSG cases, correcting split window measurements for temperature lapse rate variations, and including ancillary data to better predict where clouds and storms will form

- Ultimate goal is to combine this information with other satellite- and model-related convective initiation predictors to develop an automated system that provides probabilities of CI
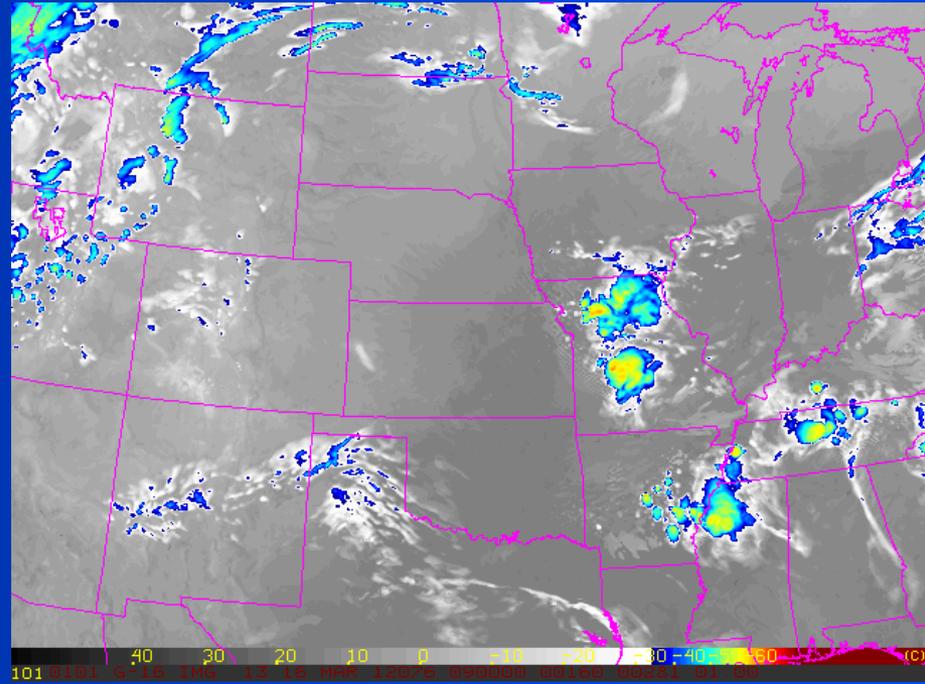
Synthetic Imagery
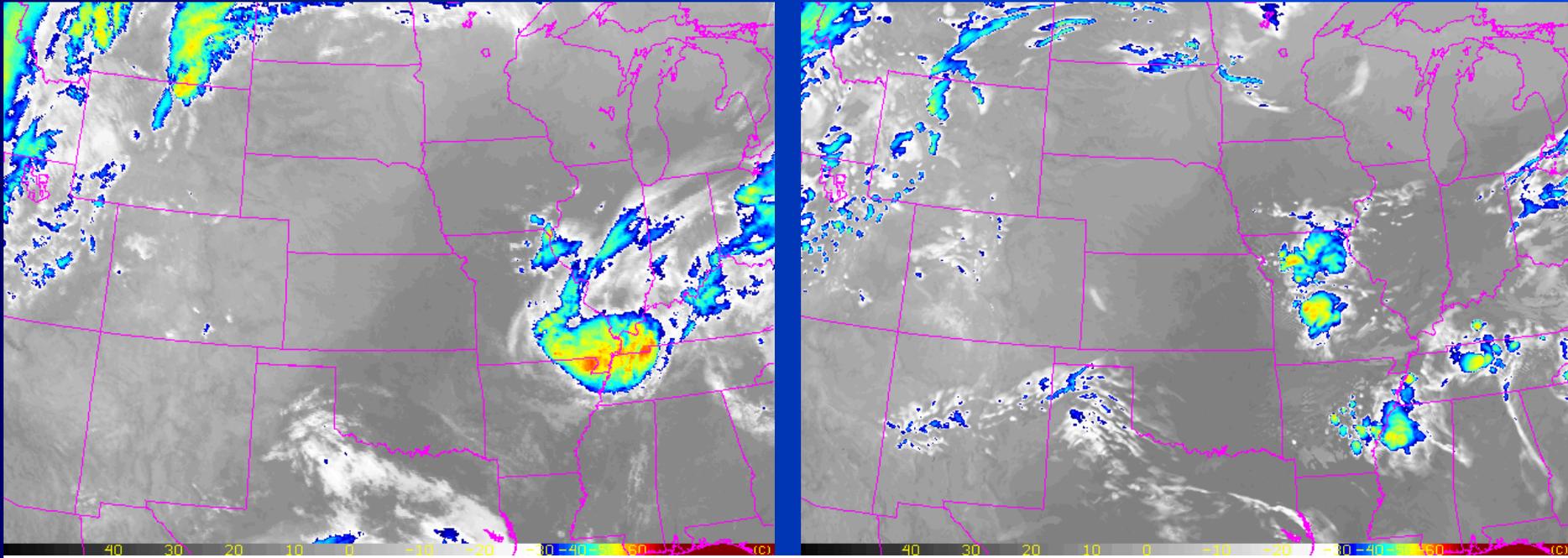
Which of these loops is actual satellite data, and which is synthetic imagery based on a model forecast?

Synthetic Imagery
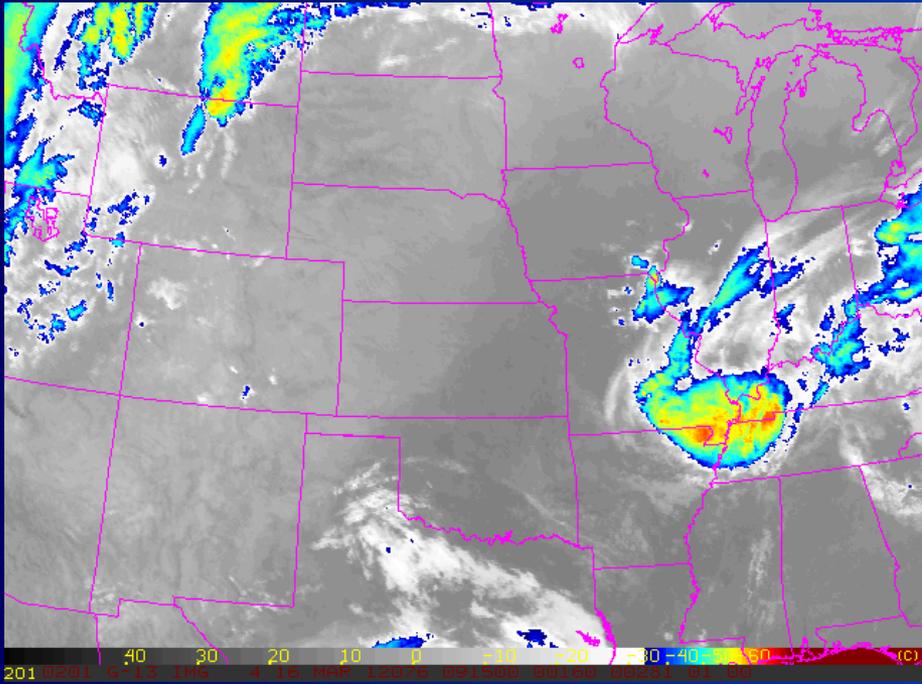
GOES-13 data from 16 March 2012 valid 09 to 21 UTC

Synthetic Imagery based on a 9- to 21-hour forecast from the WRF-ARW