

*Saharan dust motion vector extraction
from MSG-SEVIRI imagery*

Iliana Genkova, Chris Velden**

*Mel Shapiro**, Hsiao-Ming Hsu****

*Jason Dunion**, Dave Stettner**

**University of Wisconsin – Madison, USA*

***NOAA, ***NCAR*

Outline

- *Motivation*
- *Methodical approach*
- *Preliminary results*
- *Retrieval issues*
- *Future work directions*

Motivation

- *Impact on radiation fluxes*
- *Tropical cyclone genesis*
- *Atlantic ocean biota*
- *Land-atmosphere interaction*
- *Health issues*
- *Socio-economical impact*

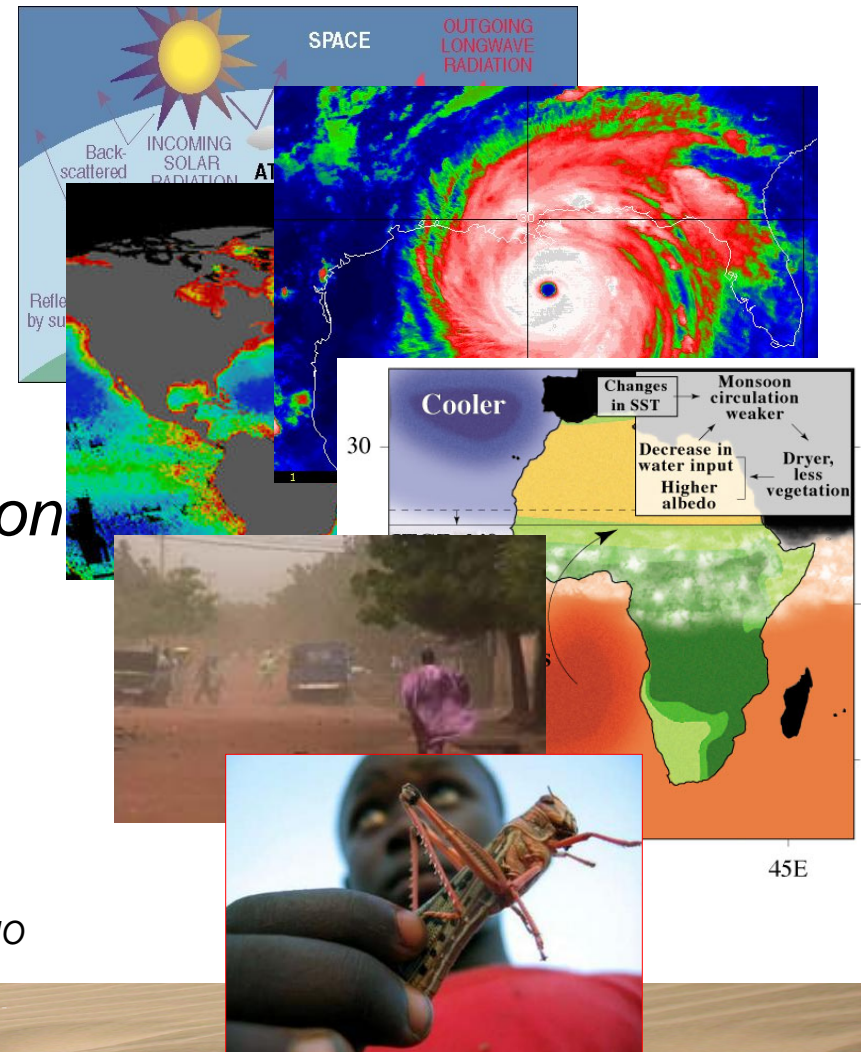


Photo credits: UMD, USGS, NASA, CIMSS, NOAA, WMO

Methodical approach

MSG SEVIRI data – 15 min imagery

- *Split-window based dust detection algorithm*

Shenk and Curran, 1974, Carlson, 1979, Li et. al, 2007

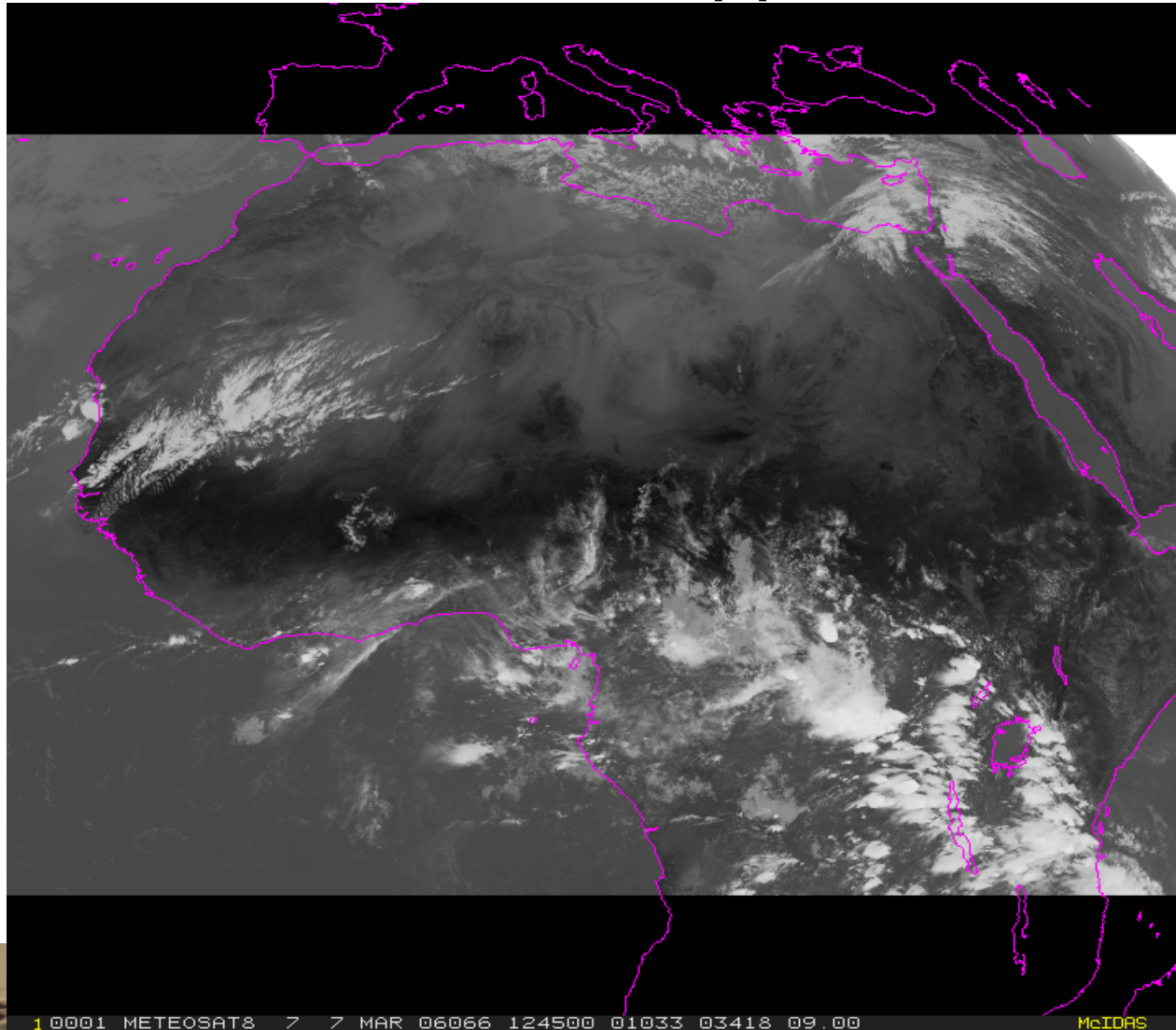
- *Image processing to augment features*

- *Motion vector (MV) extraction using the operational automated NESDIS/CIMSS cloud/water vapor feature tracking AMV retrieval algorithm -*

5x5 target box, 17x17 search box

- *Sahara dust MV Quality control (QI)*

Methodical approach



DUST MASK:

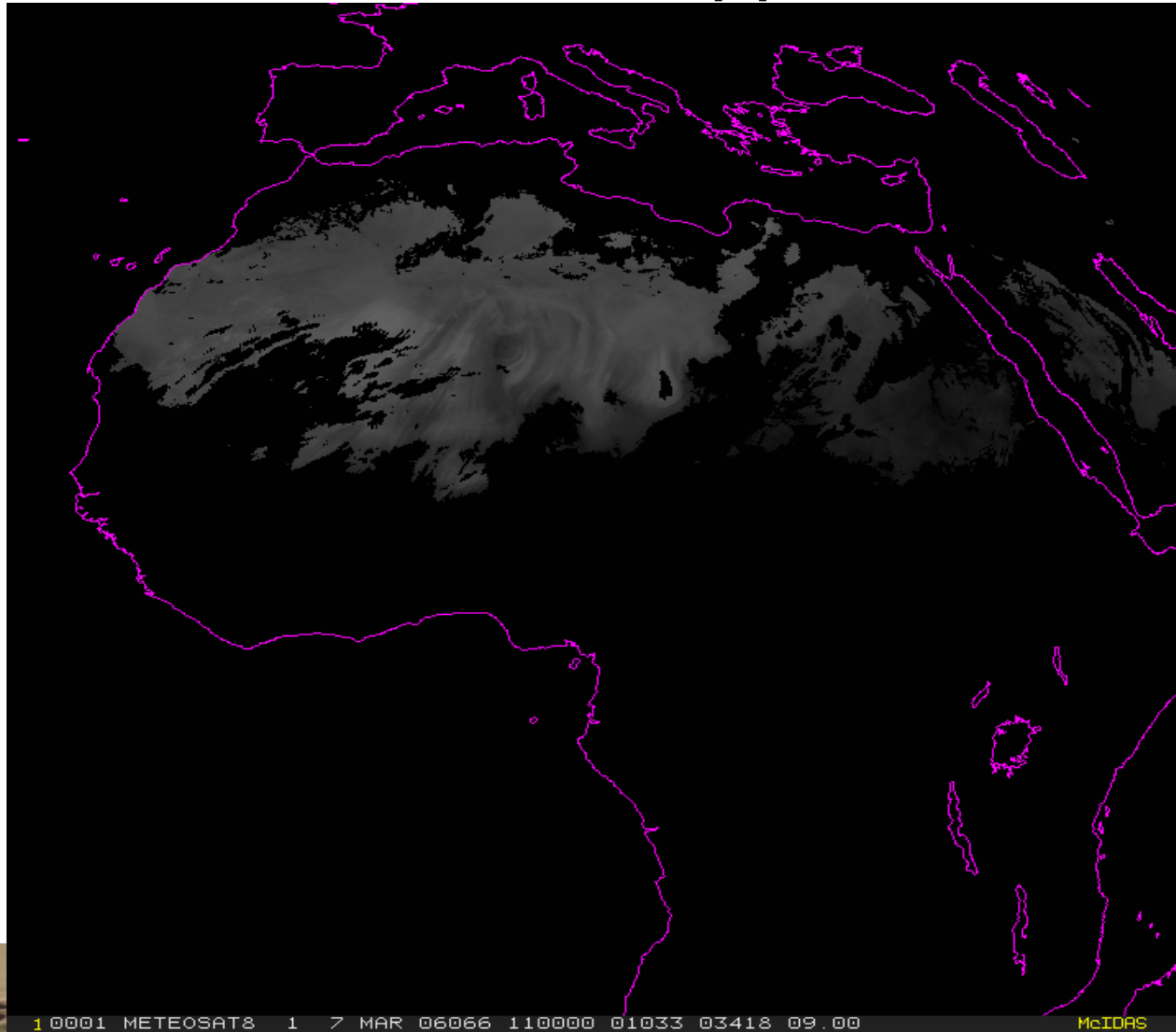
$$D = BT10.8 - BT12.1$$

$$D \leq 3.5 \text{ degK}$$

$$D \geq 0.5 \text{ degK}$$

$$BT10.8 \geq 280 \text{ degK}$$

Methodical approach

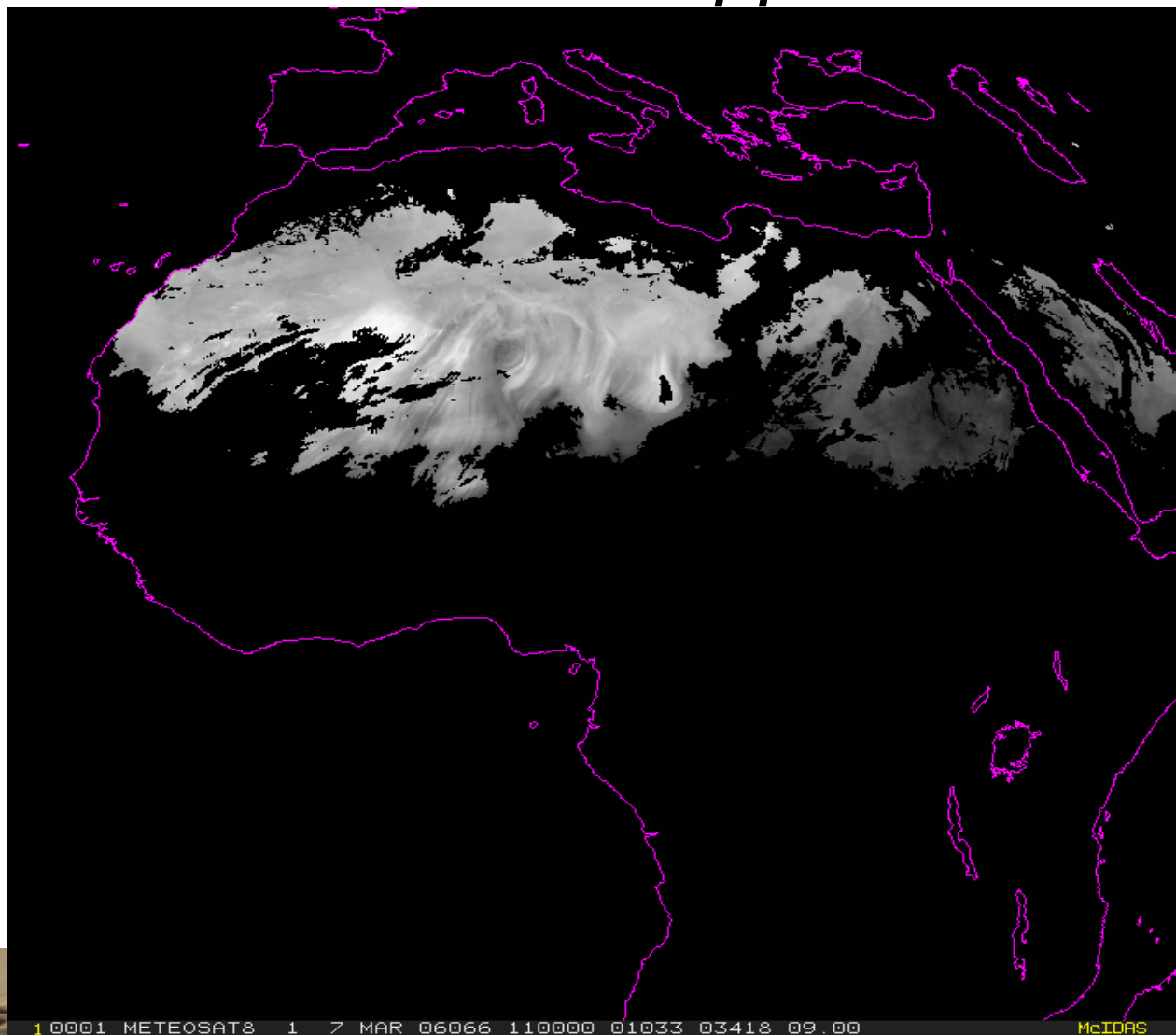


Enhancement

Two median filters

Histogram stretch

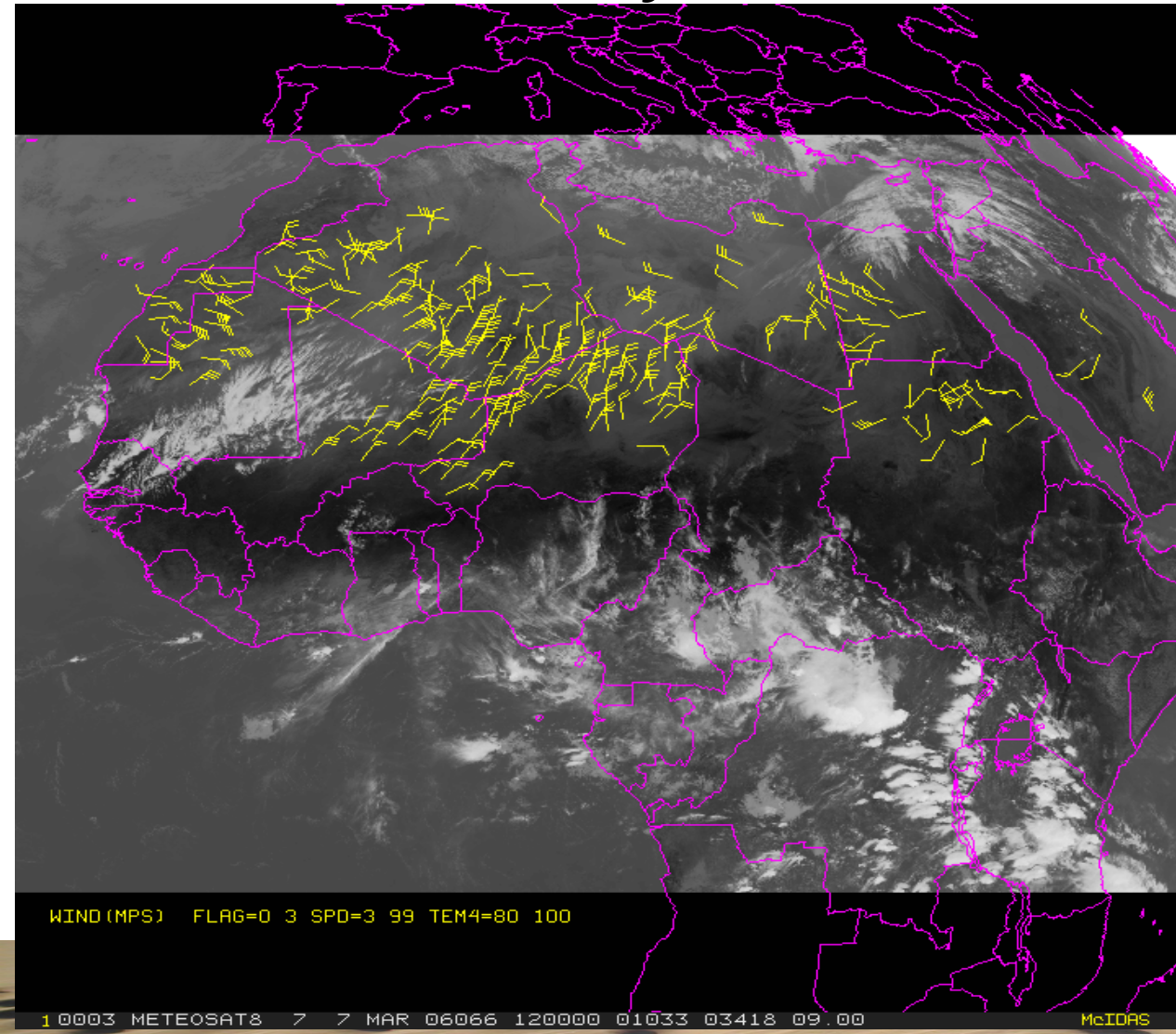
Methodical approach

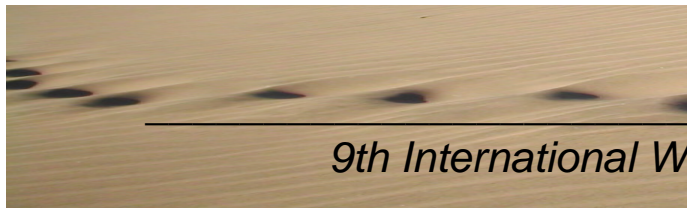
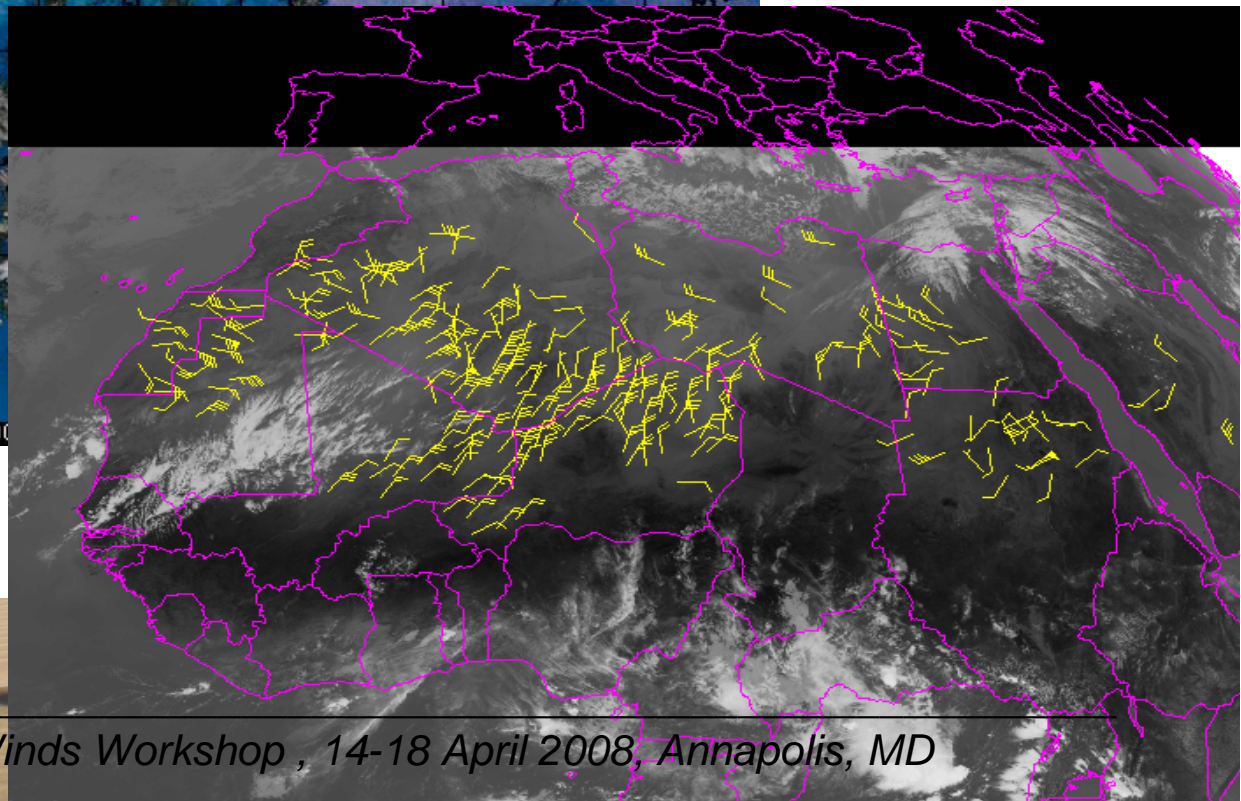
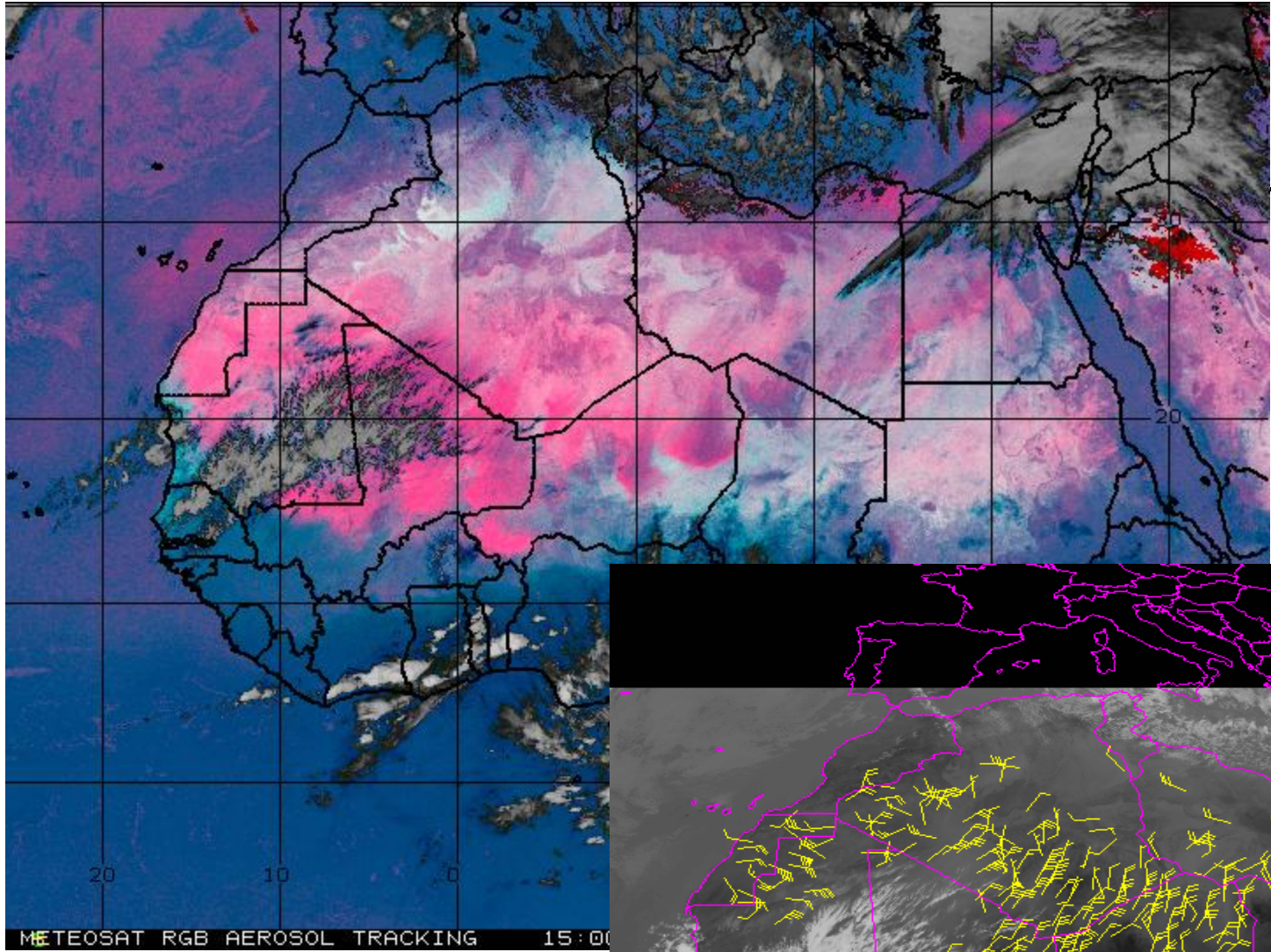


- Motion vector extraction
- Quality control

Preliminary results

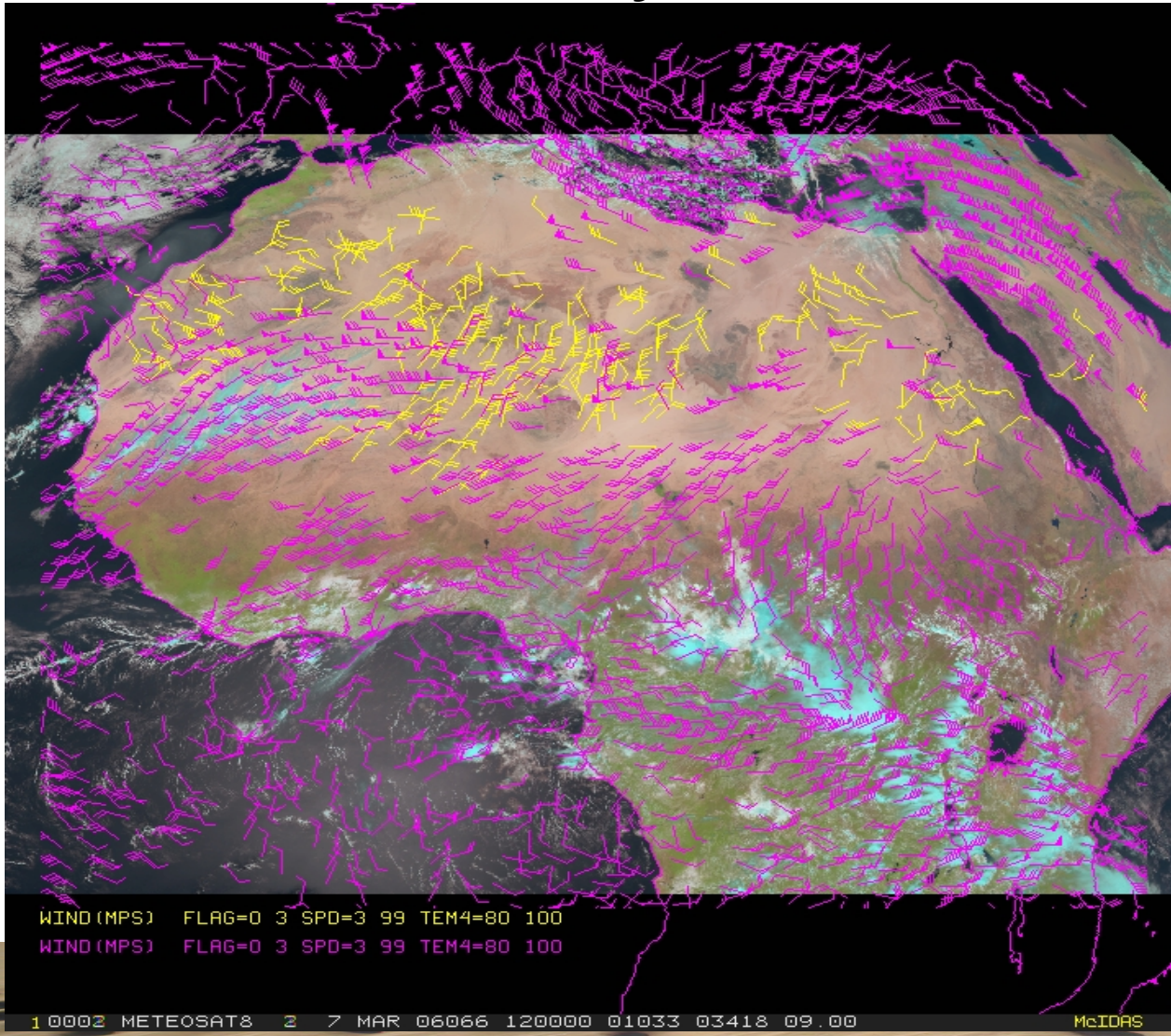
07 March 2006, 12Z





9th International Winds Workshop , 14-18 April 2008, Annapolis, MD

Preliminary results



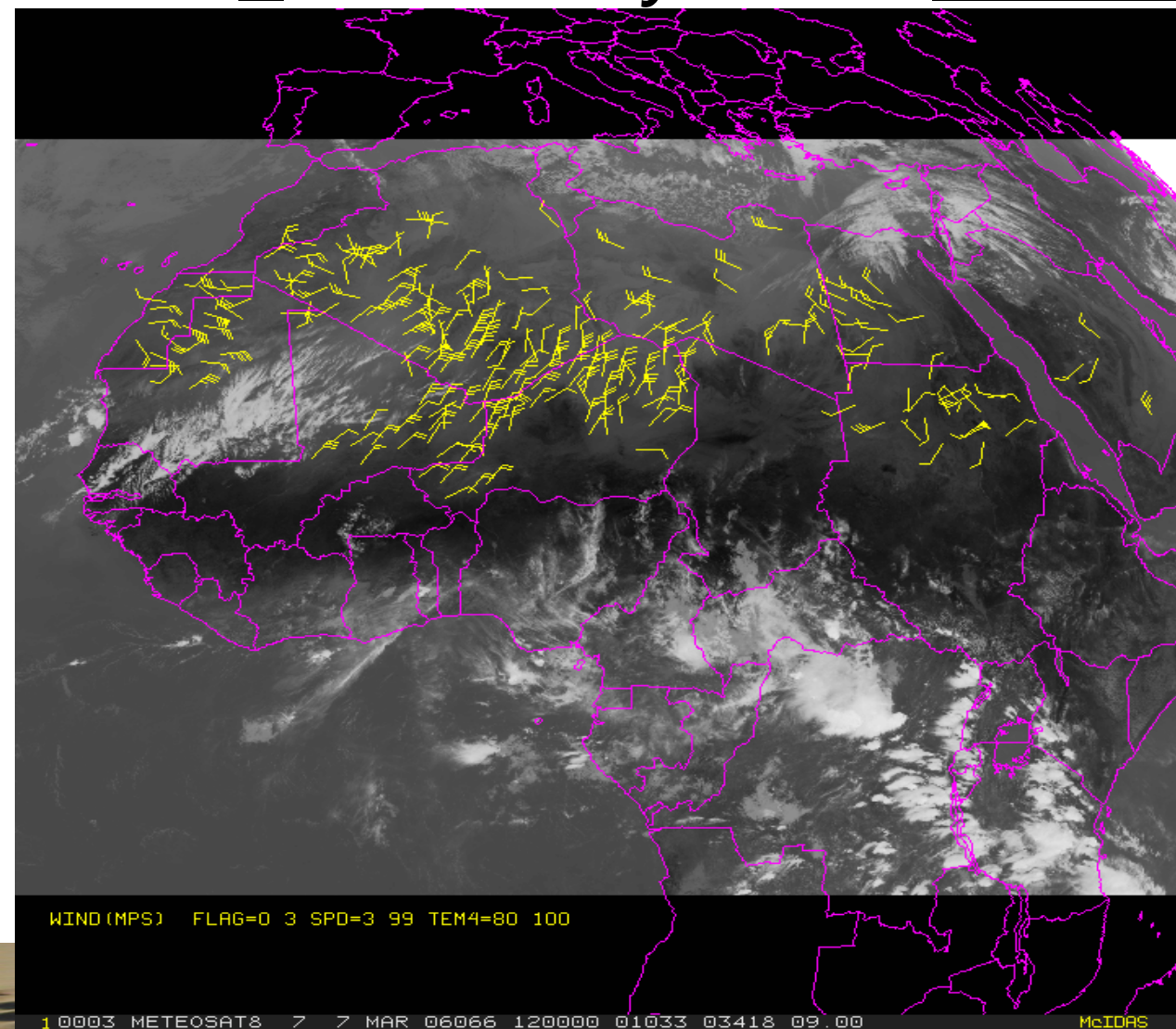
07 March 2006, 12Z

Sahara dust – yellow

Clouds/WV - magenta

Preliminary results

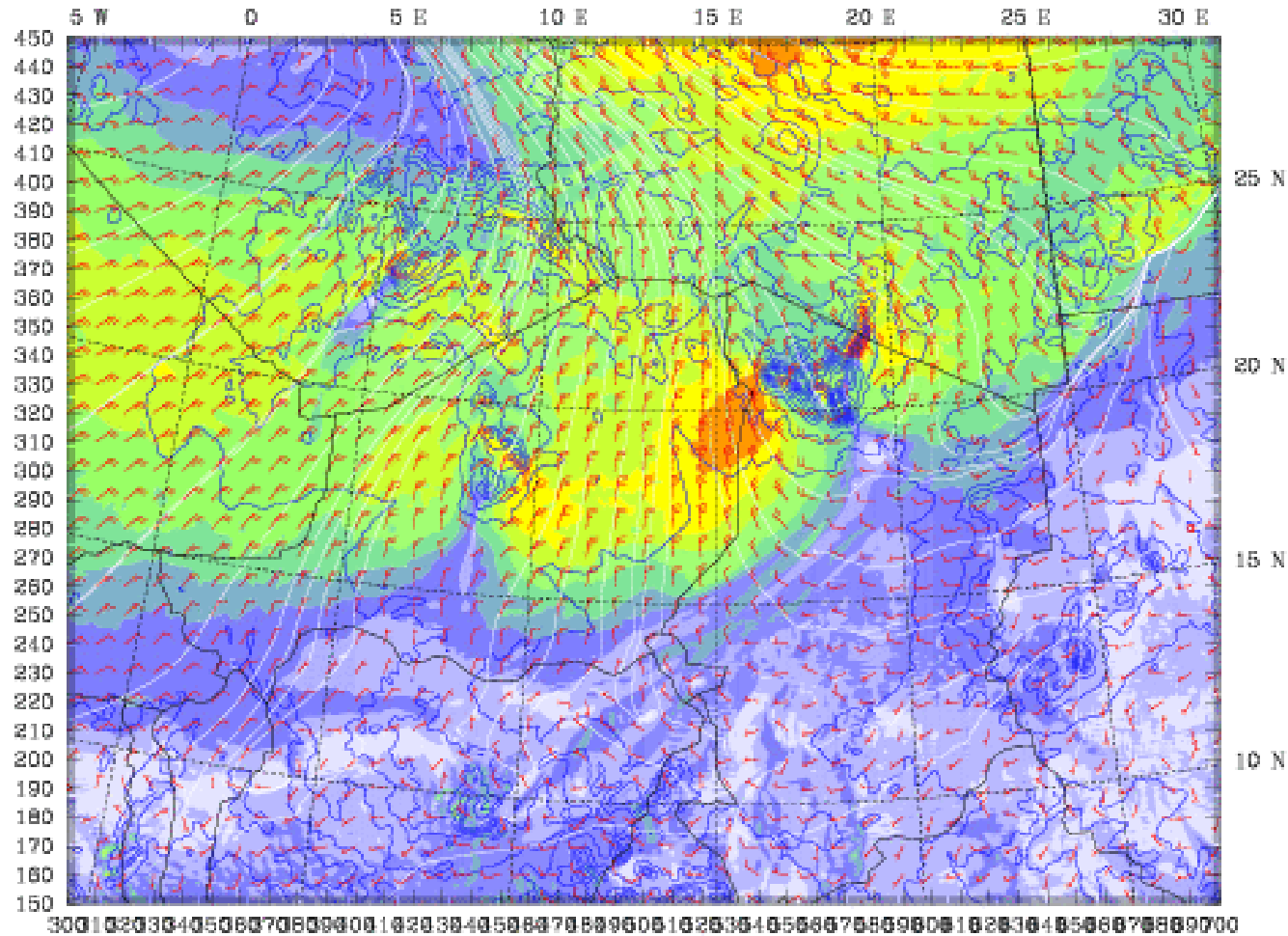
07 March 2006, 12Z



9th International Winds Workshop , 14-18 April 2008, Annapolis, MD

Dataset: afr06 3d d03 RIP: afr06 d03 sfc2 stm Init: 0000 UTC Sun 05 Mar 06
 Post: 63.00 h Valid: 1500 UTC Tue 07 Mar 06 (1100 LST Tue 07 Mar 06)
 Horizontal wind speed at k-index = 30
 Terrain height AMSL
 Horizontal wind streamlines at k-index = 30
 Horizontal wind vectors at k-index = 30

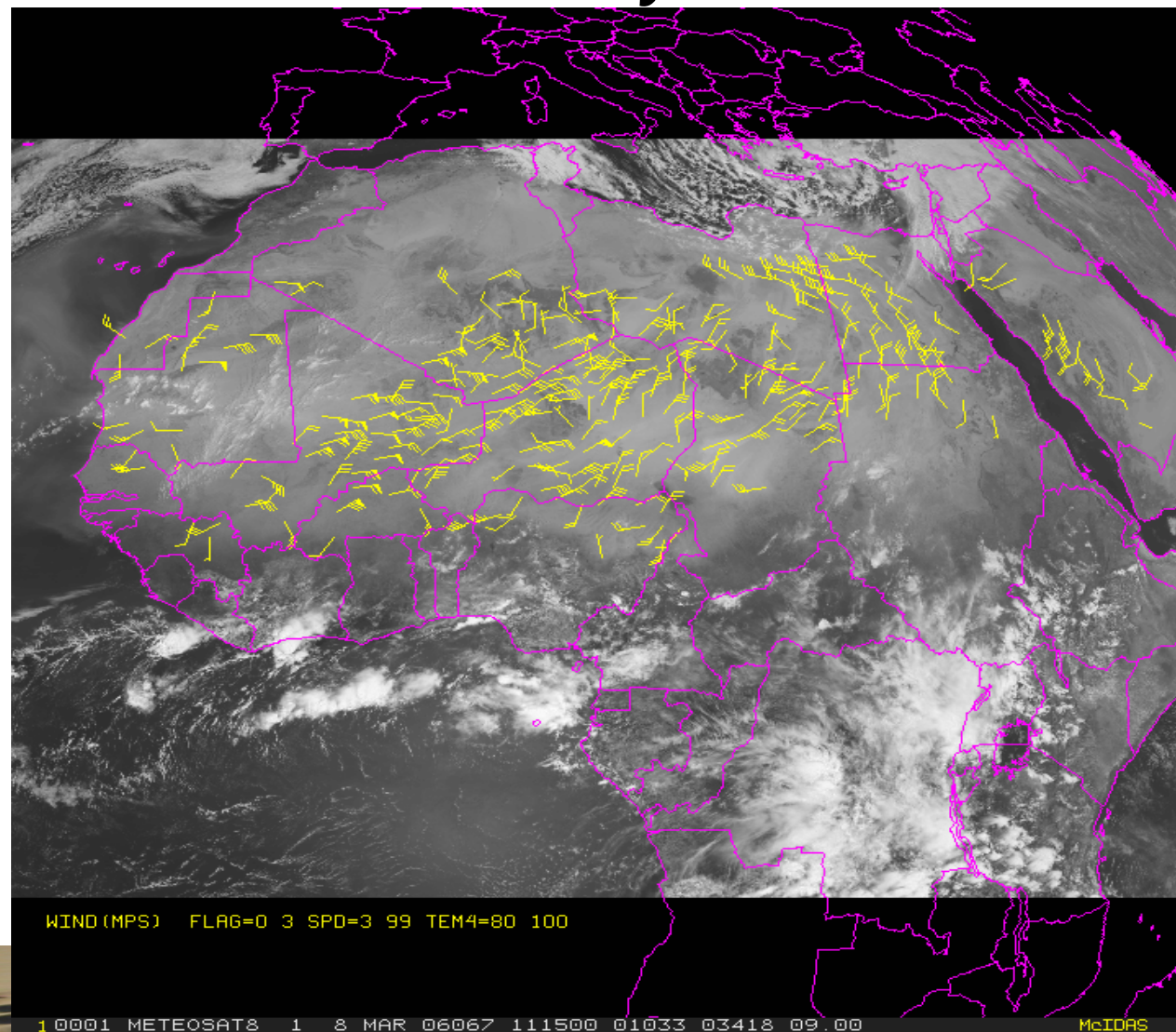
07 March 2006, 12Z



BARR VECTORS: FULL BARR = 5 m s⁻¹
 CONTOURS: UNITS=m LOW= 200.0 HIGH= 2000.0 INTERVAL= 200.00
 Model Info: V2.1.2 M BMJ YSU PBL WSM 6class Noah LSM 9.0 km, 30 levels, 27 sec
 LW: RRTM SW: Goddard DIFF: simple KW: 2D Smager

Preliminary results

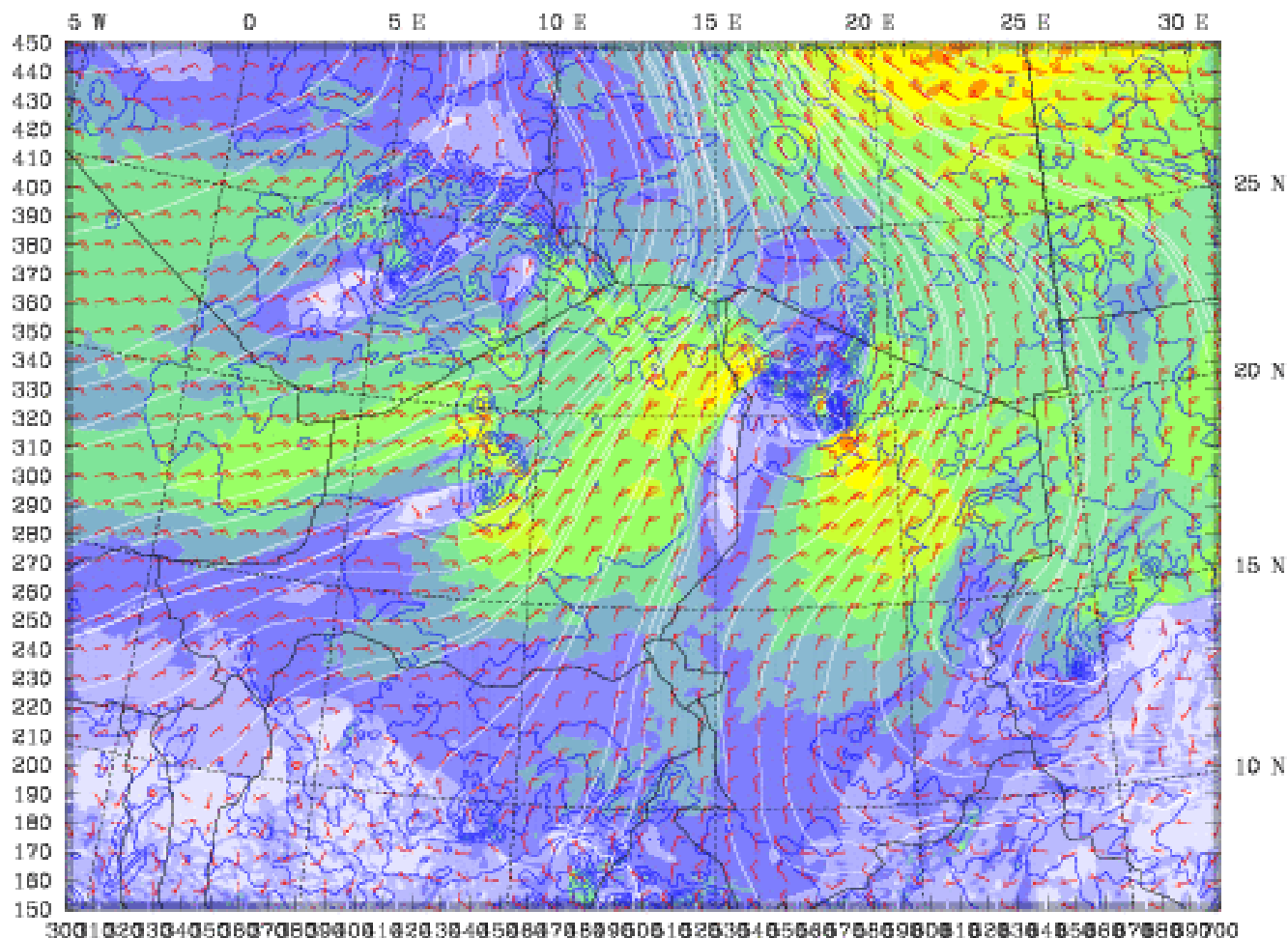
08 March 2006, 11Z



9th International Winds Workshop , 14-18 April 2008, Annapolis, MD

Dataset: afr06 3d d03 RIP: afr06 d03 sfc2 stm Init: 0000 UTC Sun 05 Mar 06
 Fcst: 87.00 h Valid: 1500 UTC Wed 08 Mar 06 (1100 LST Wed 08 Mar 06)
 Horizontal wind speed at k-index = 30
 Terrain height AMSL
 Horizontal wind streamlines at k-index = 30
 Horizontal wind vectors at k-index = 30

08 March 2006, 11Z

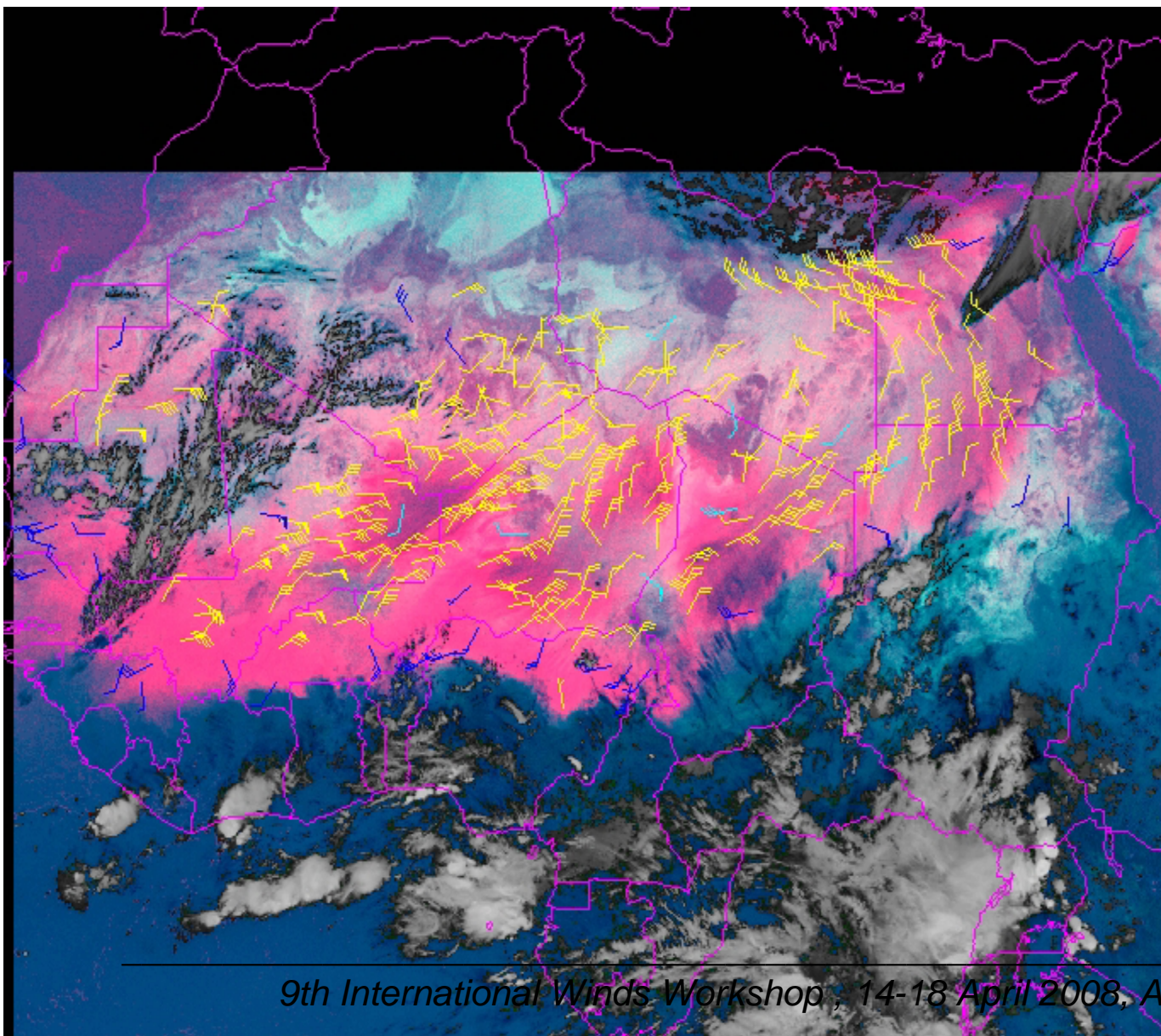


Model Info: V2.1.2 M BMJ YSU PBL WSM 6class Noah LSM 9.0 km, 30 levels, 27 sec
 LW: RRTM SW: Goddard DIFF: simple KW: 2D Smagor

Current issues

- *Cirrus cloud contamination*
- *Height assignment*
- *Validation data*
- *'Turbulent' areas*

Current issues



Yellow – good

*Dark blue – Ci
contamination*

*Light blue – still
under investigation*

Future work

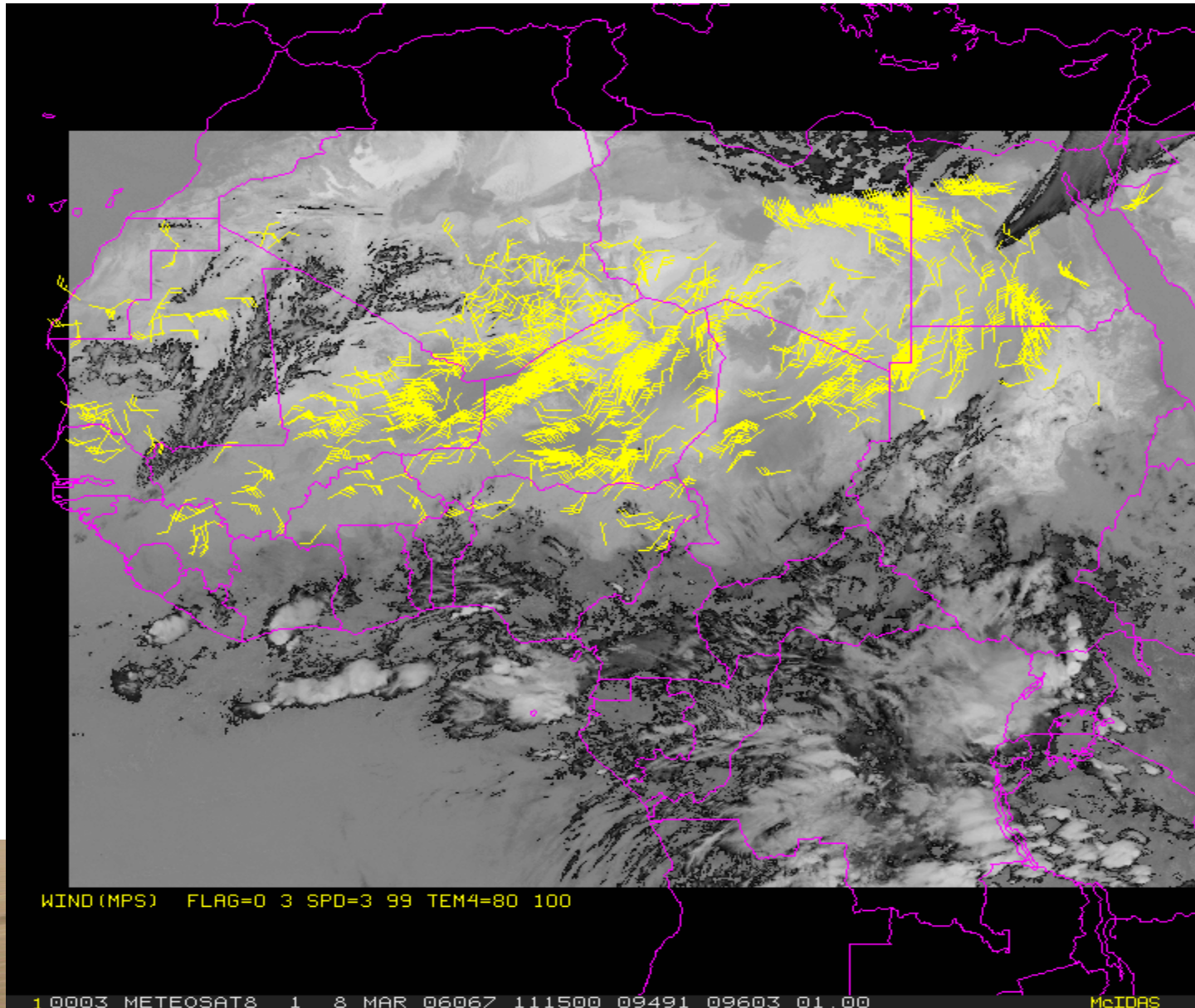
- *Improve dust mask –*
 - *day and night time*
 - *over land, over ocean*
 - *seasonal*
- *Develop dust MV ‘specific’ quality control means*
- *Address height assignment*
- *Validate !!!*
- *Inter-compare with model data*

Thank you! _____



_____ *9th International Winds Workshop , 14-18 April 2008, Annapolis, MD*

Extras



Extras

