Use of MSG data with other data sets in severe weather forecasting

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EUMETSAT 2-7-2014

Data set available

- Synoptic (MDD)
- Satellite (MSG Channels, RGB products) MPEF, SAF Products e.g. (Now casting SAF), MODIS products, Jason Sea wind data, Wind Models data, etc
- NWP models
  - different spatial and temporal resolutions (UK Models (3,to 0.5 deg), WRFs, ECMWF models, Local models (LAM, regional models) and many more
  - Diagnostic models (manual plots and analyses, development and forecast)
- Radar data for nowcasting (not common),
- Climatology (seasonal information with shift from normal)

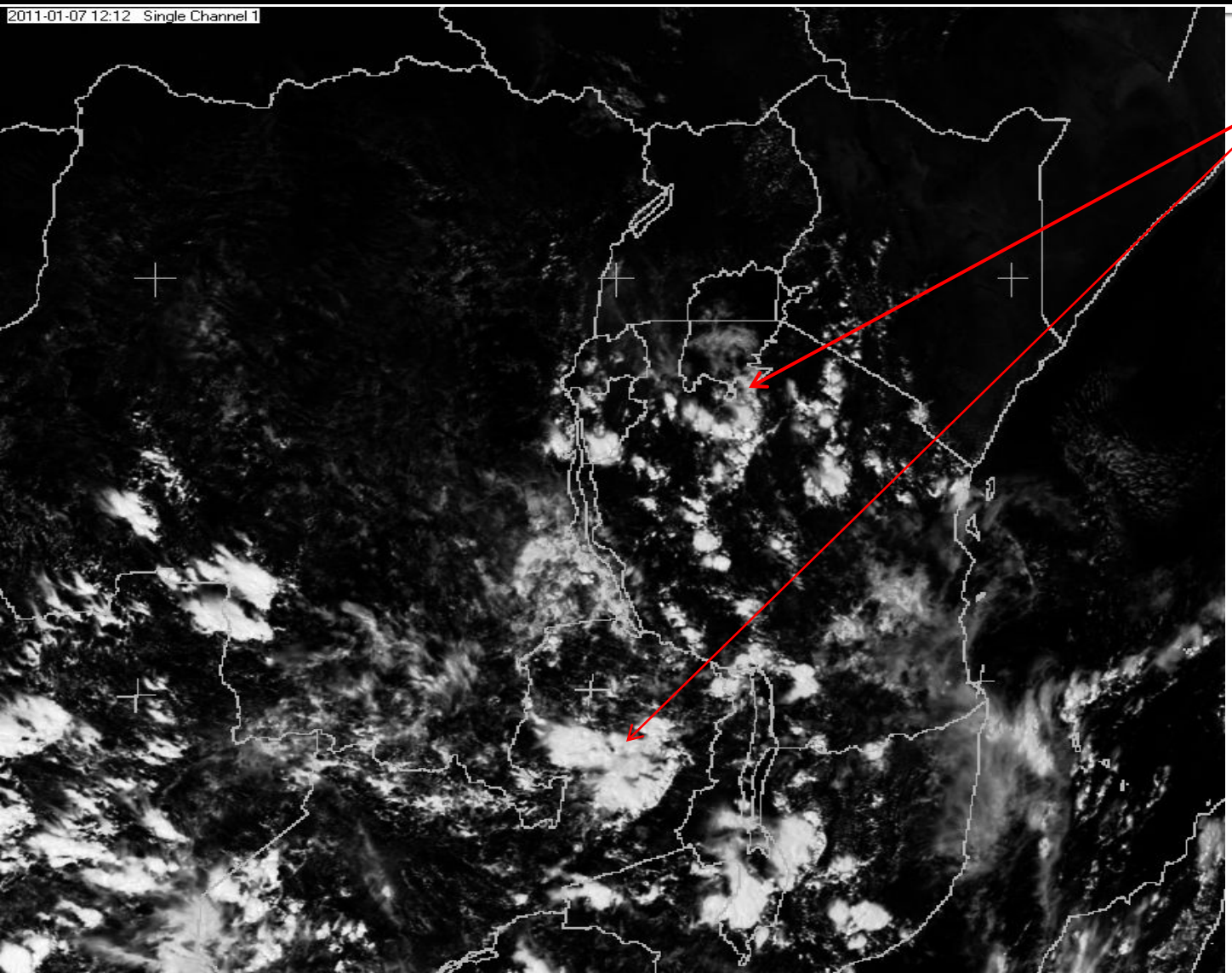
Synergie Workstation System designed to: Integrate all data types

- The Role of experienced Forecaster is to obtain optimum information from ALL available data and make Reliable Forecast
- Let us take a systematic approach in maximizing on all data handling in order to make a **Severe Weather Forecast**

Steps in Severe WX Identification Using MSG data on Synergie

- Assumptions :
  - all participants have access of Synergie system back home.
  - EUMETcast reception for Near Real Time (NRT) data for this exercises (Best case).
- Step 1. What season are we? Rainy season! Hence certainty of Severe/WX cases is likely
- Step 2. Display a VIS Image for current wx, if daytime otherwise use ch4 (3.9) or RGB Night microphysics for night time,
  - to identify locations of any convection by presence of water or ice clouds

Step 2: Display VIS-1 (0.6 µm) day

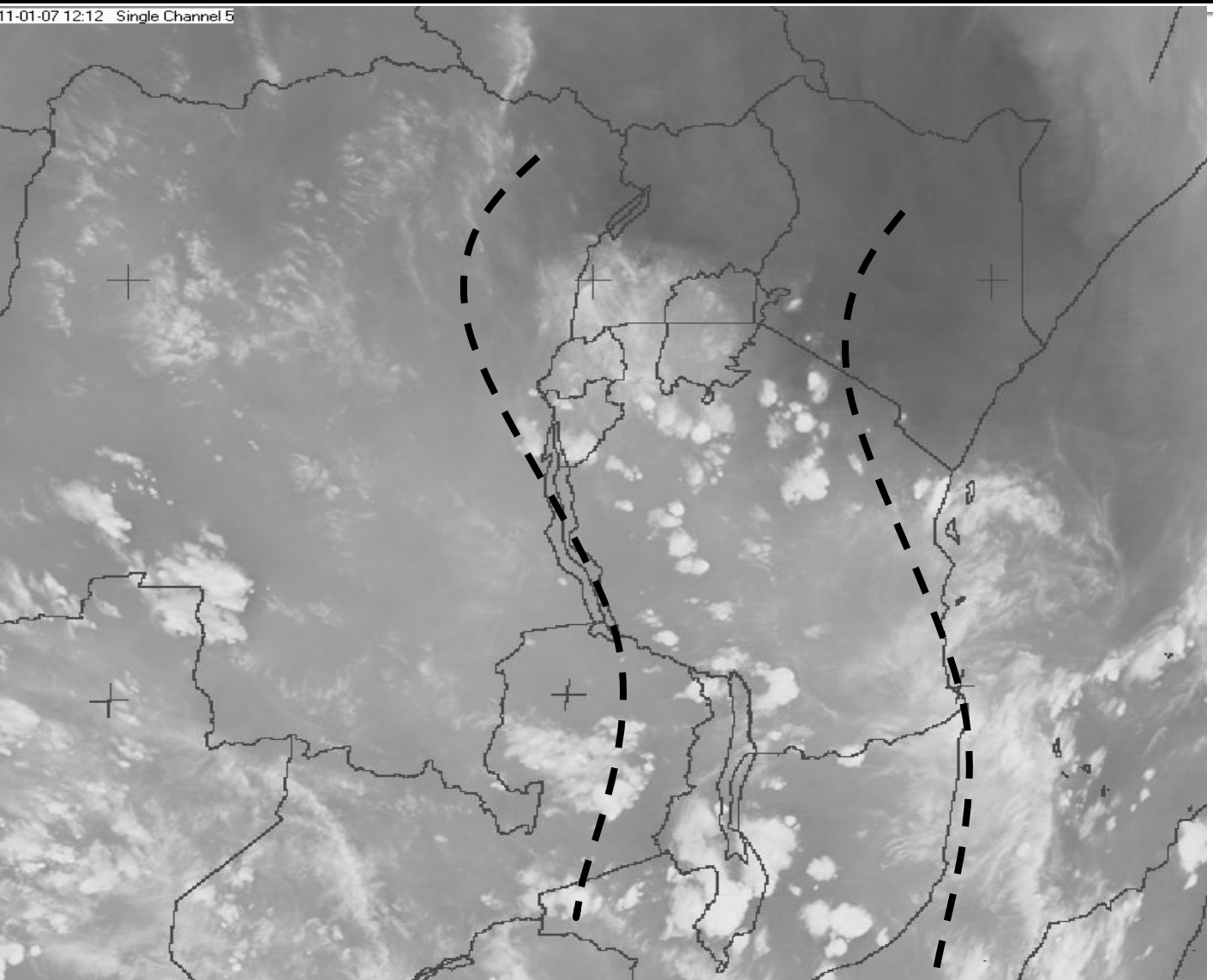


Several convective cells at different stages of development

Step 3: Use WV5 and WV6, why?

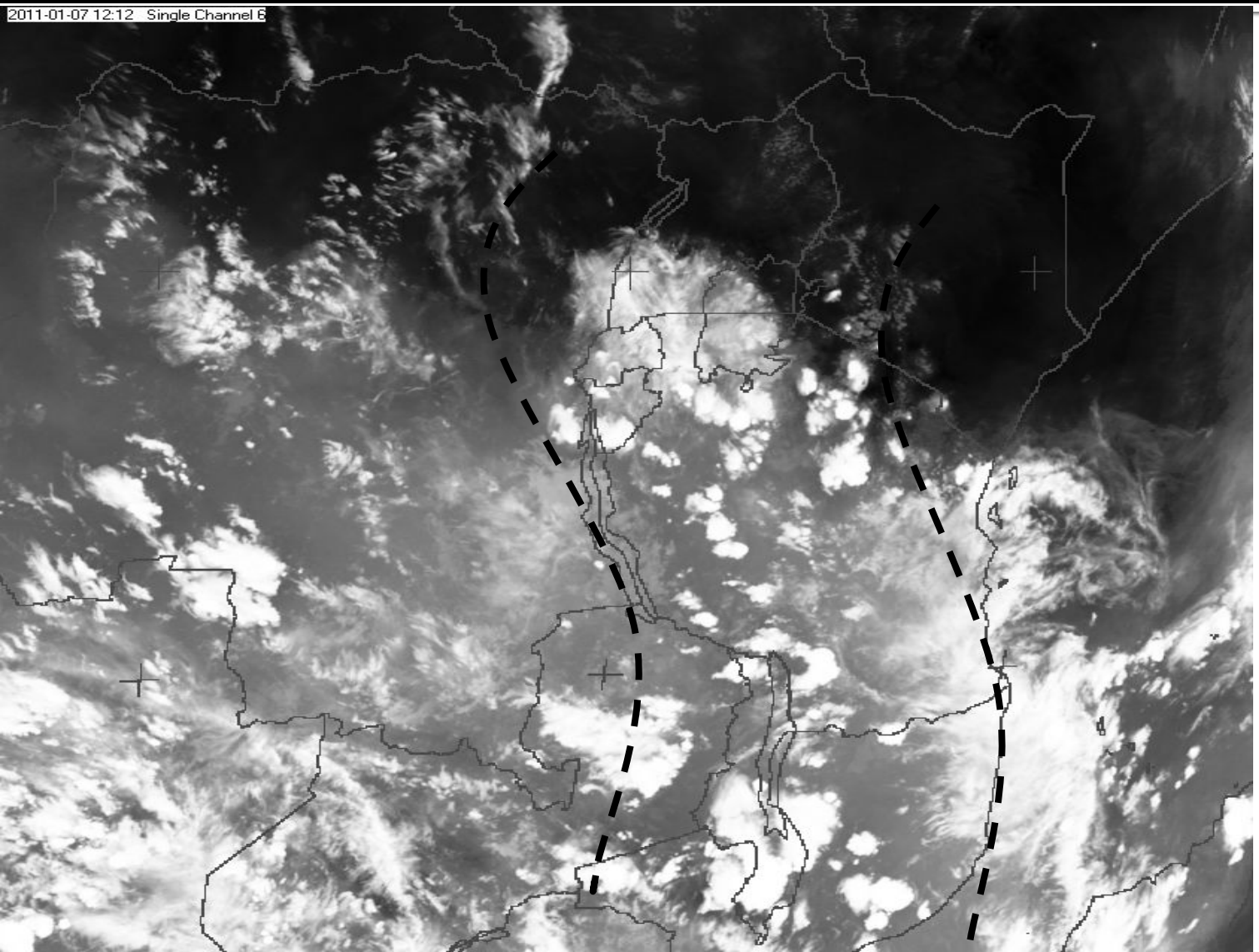
- Use WV 6.2 and 7.3 microns to identify potential areas with enough moisture to support further development (Deep column)
- White areas are moist and cold, dark or grey areas are warmer and dry
- Upper level moisture from use WV5 (6.2)
- Medium Level moisture from WV6 (7.3)

Step 3.1 : display WV5 data



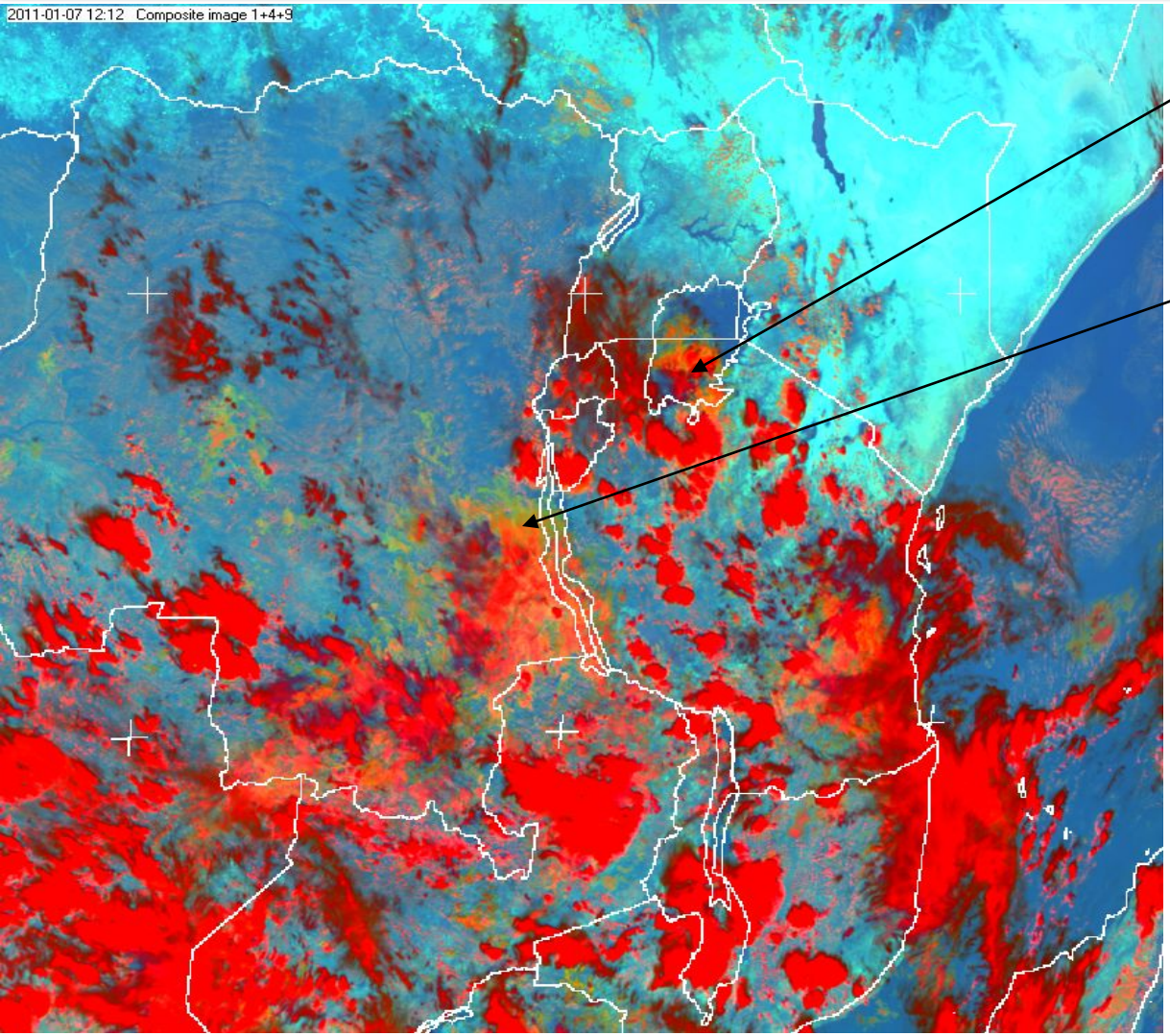
1. Convective cells are within the high density water vapour.
2. They exist in region a convergence zone.
3. Moisture supply is at upper levels
4. Time is 12:12 pm
5. Further development possible

Step 3.2: display WV6 for Mid Level Moisture



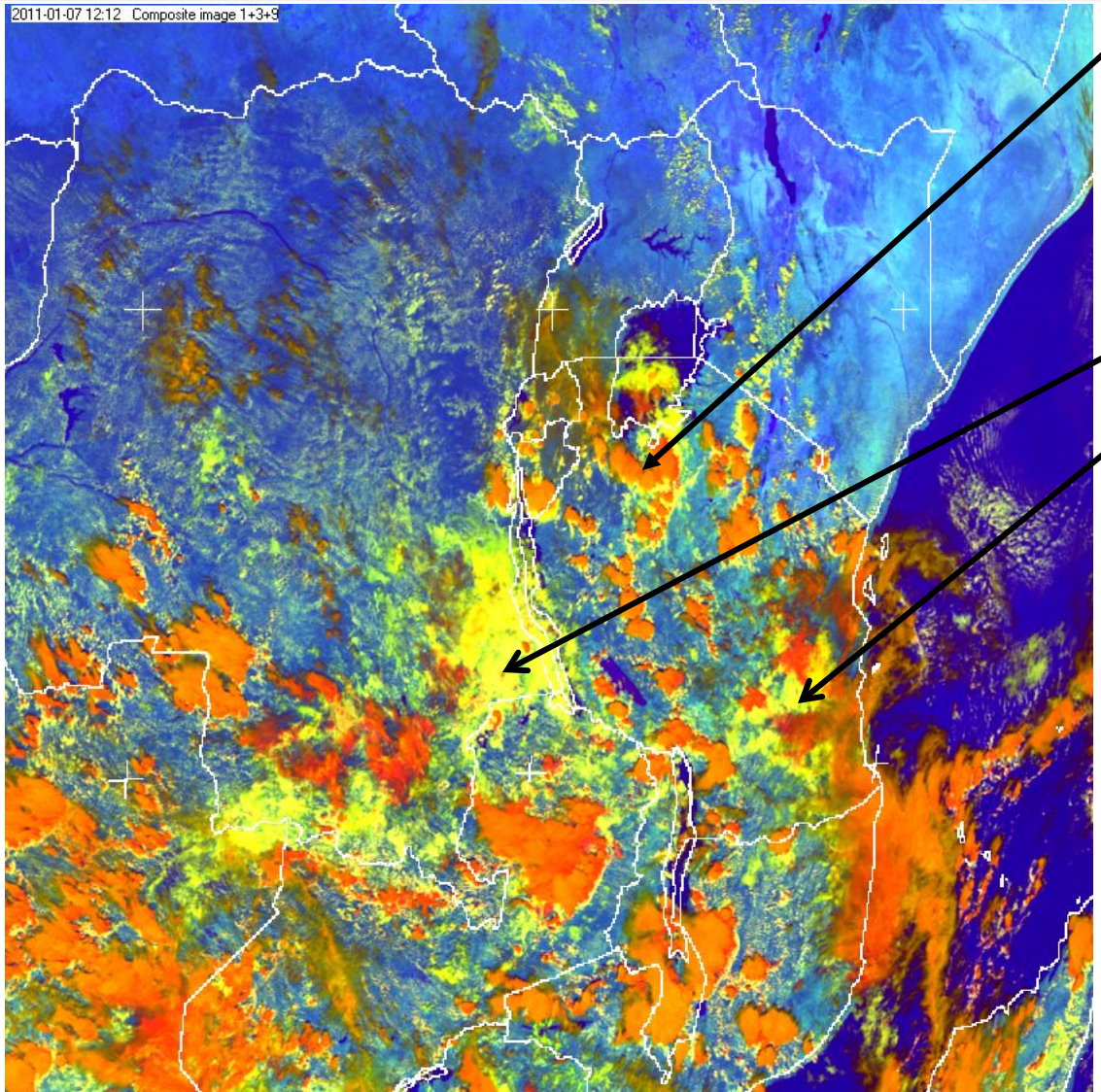
Sufficient moisture supply at mid levels 600-850 hPa

Step 5.1: Confirm microphysics or stages of convection by RGB149,



- Deep red indicates very cold large ice clouds (highest levels).
- The Yellow brown are areas with small ice and water clouds at stage of development seen over lake Tanganyika.
- Cyan is cloud free and warm
- Deep Blue is warm water body

Step 5.2: Confirm microphysics or stages of convection by RGB139



Deep Oranges brown indicates very cold large ice clouds.

The yellow areas are clouds with small ice and water clouds at stage of development-Super-cooled (-33 deg) clouds, see over lake Tanganyika.

Cyan is cloud free and warm.

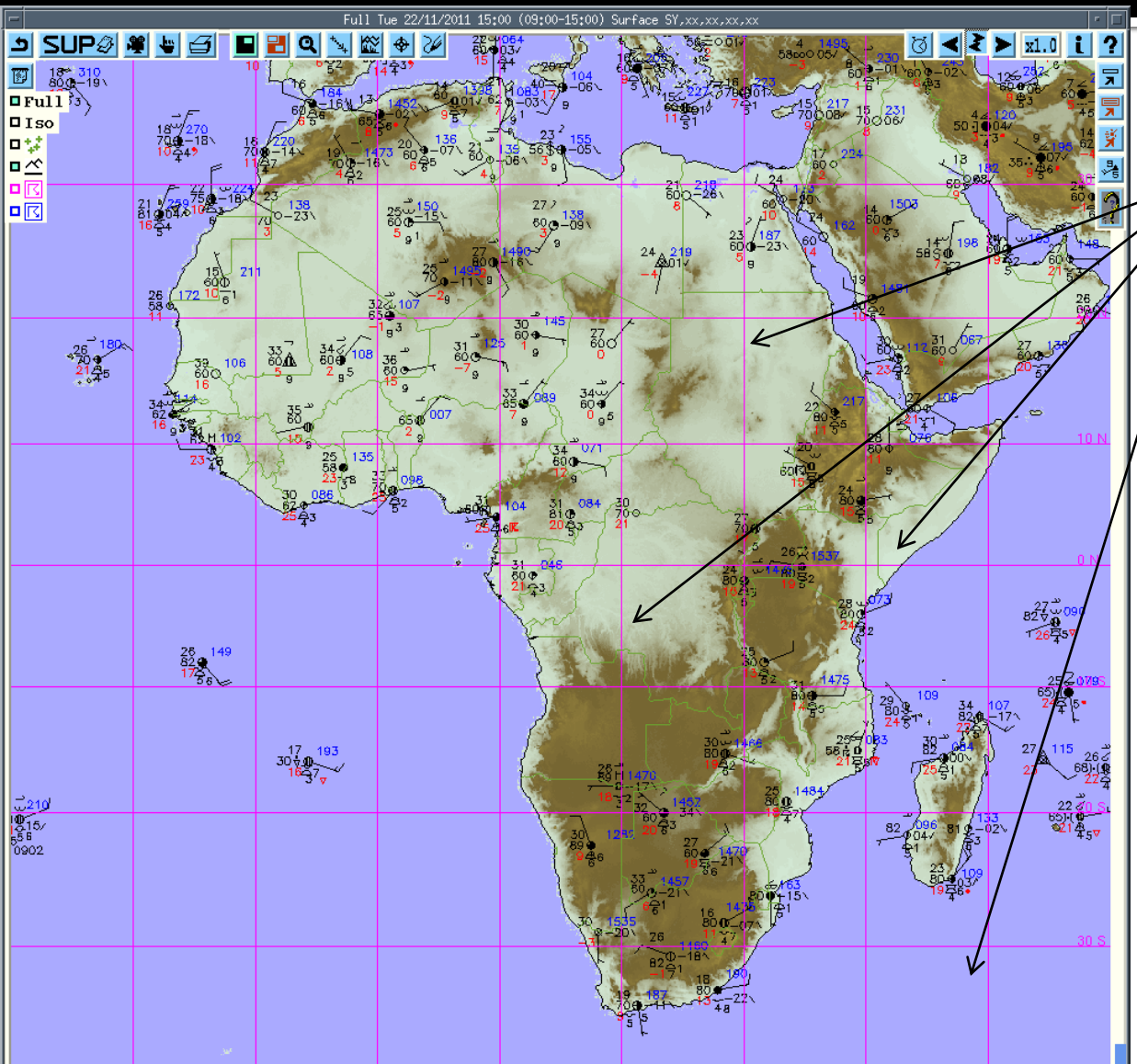
Deep Blue is warm water body.

Thin Cirrus clouds appear dark brown

Step 6: Get synoptic data

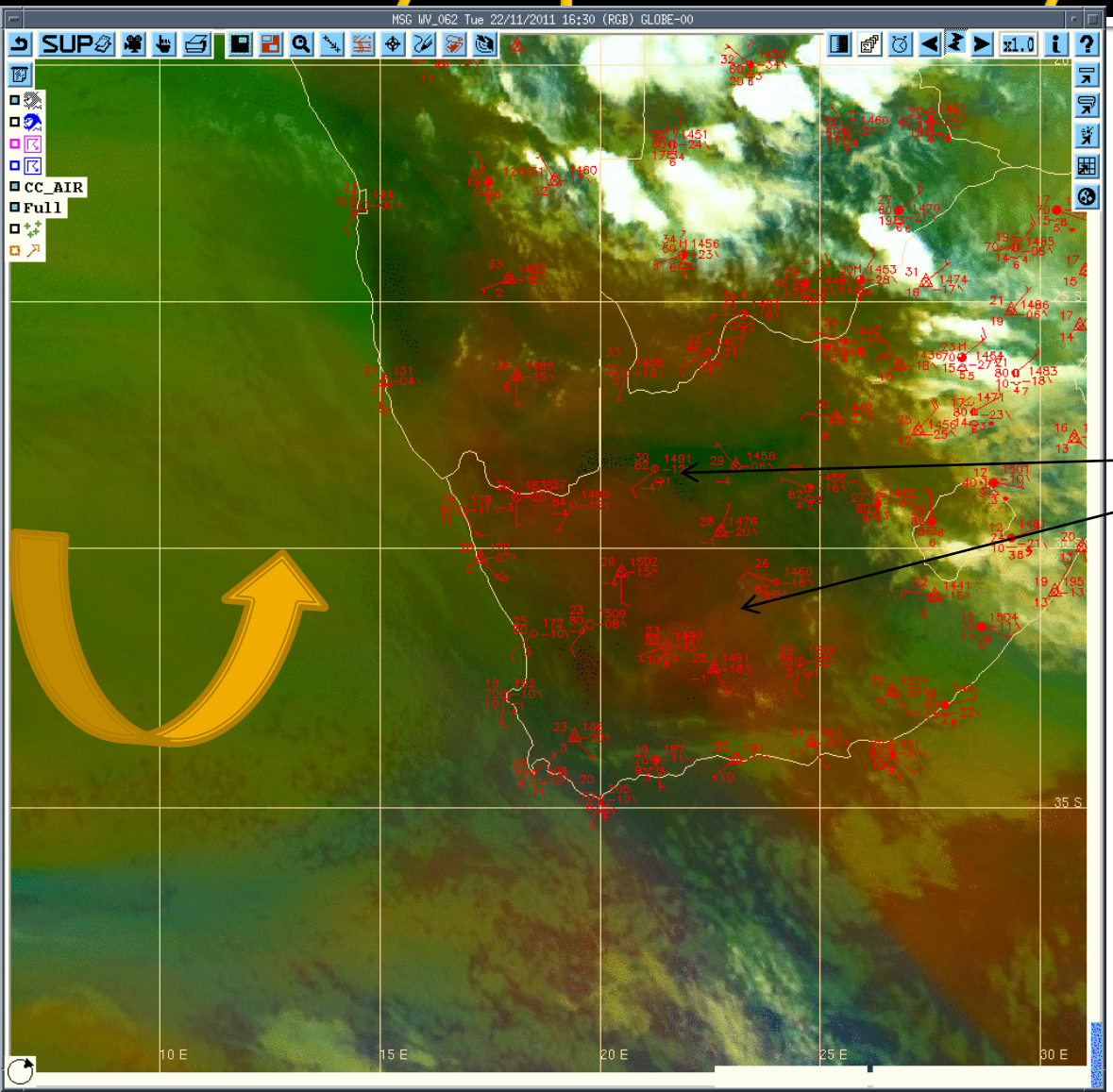
- View reported synoptic data for synoptic hours.
- Confirm from dry bulb and wet bulb data for drying or increase in moisture from depression values (differences of Ta-Tw).
  - Confirm with AIRMASS RGB 5-6,8-7,5
- You may use conditional plotting of Synergy tools.

Full Synoptic chart 15:00 utc



There is Scarcity of synoptic data. This needs to be complemented by Satellite data and NWP

2/2 Synoptic chart: Airmass RGB with Synoptic Overlay (22/11/11)



Dry cold airmass from Southern tip of Africa.

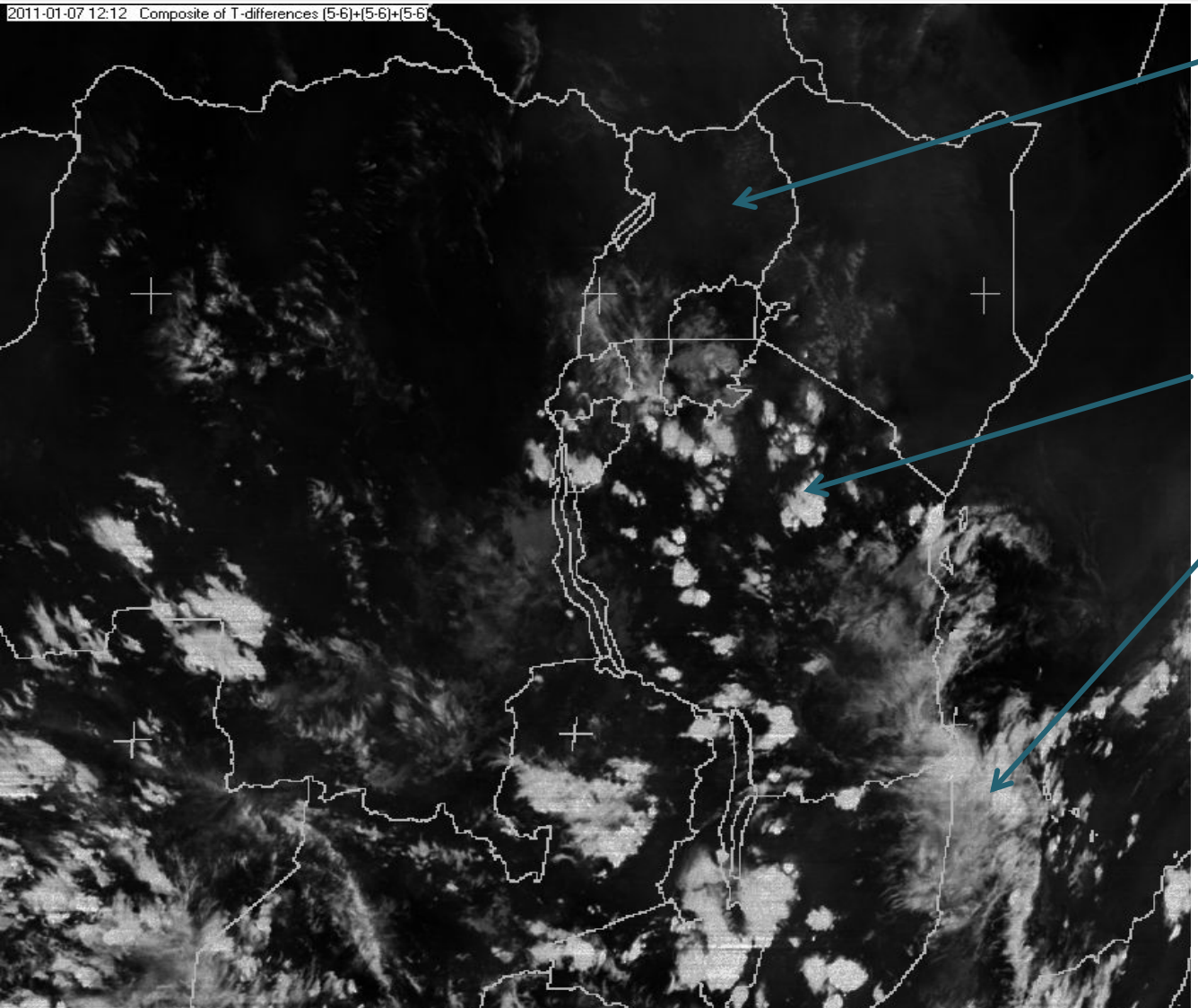
This appears to be under St Hellena high pressure ridge cell (descending air)

Depression= Dry Bulb (30) - wet bulb (-4). =34° C

Step 7. Severe weather arises from deep convection

- Deep convection goes beyond medium and upper tropopause hence
- Any weather feature or instability that
  - causes BT difference (WV5-WV6) >0 generates
  - Thunderstorms and Heavy rain

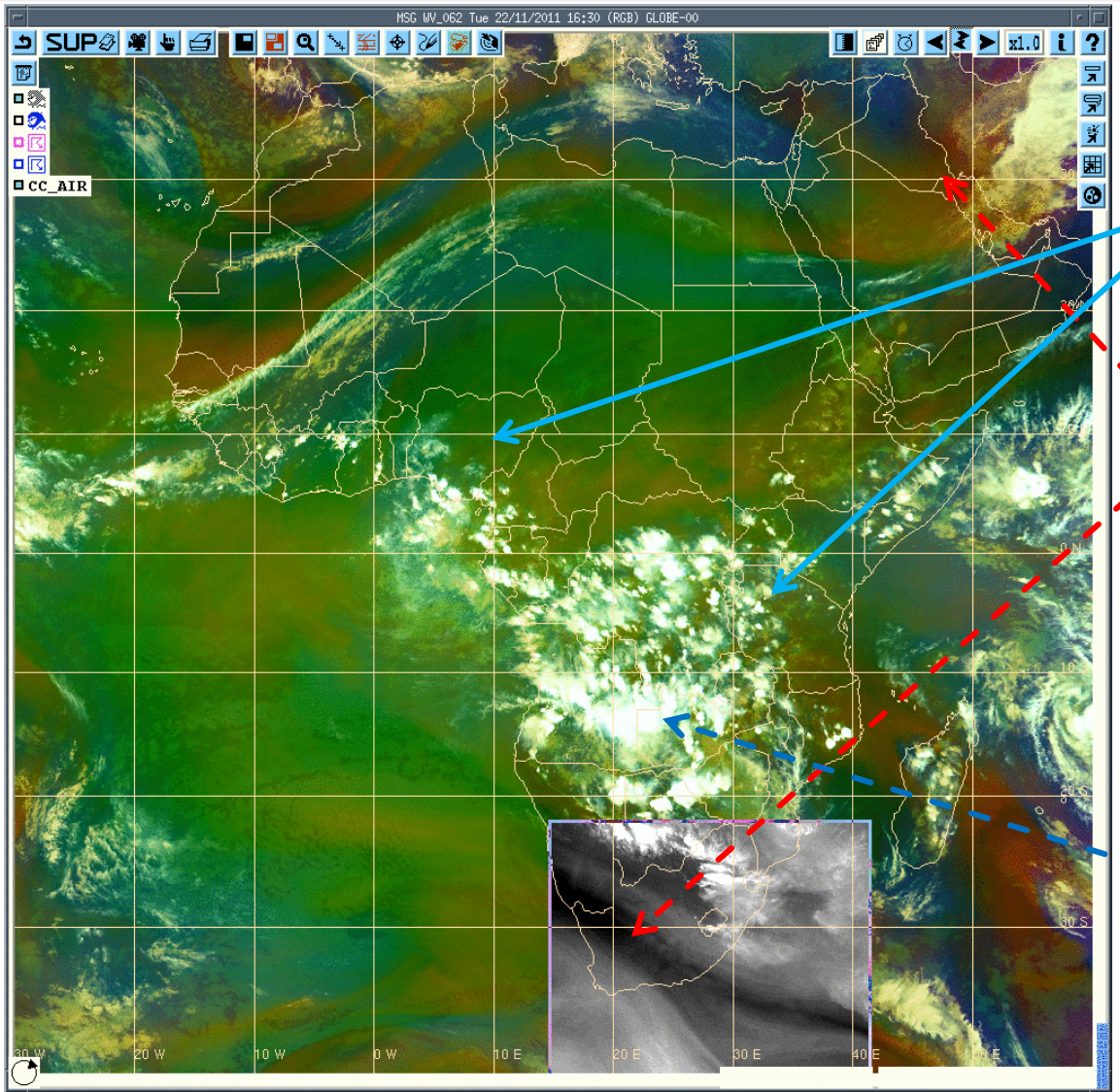
Step 7.1: Analysis for deep convection by BTD of WV5-WV6 product



Dark is negative values (dry)

White is small positive values signifying overshooting clouds.

Step7.2: WV5 Merge with AIRMASS RGB (5-6,8-7, 5i)



To detect :

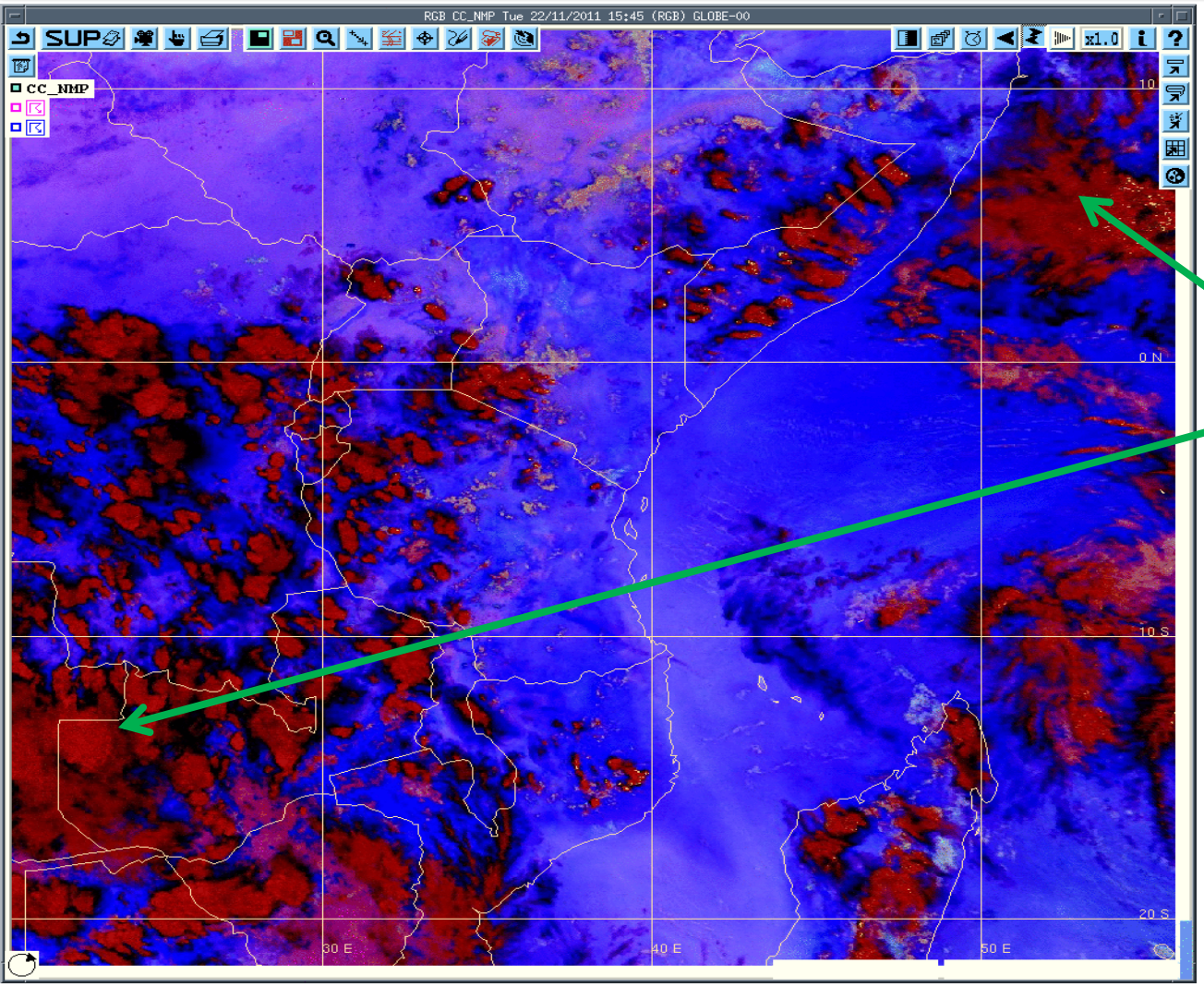
moist air sources

dry airmass

And possible direction of flow

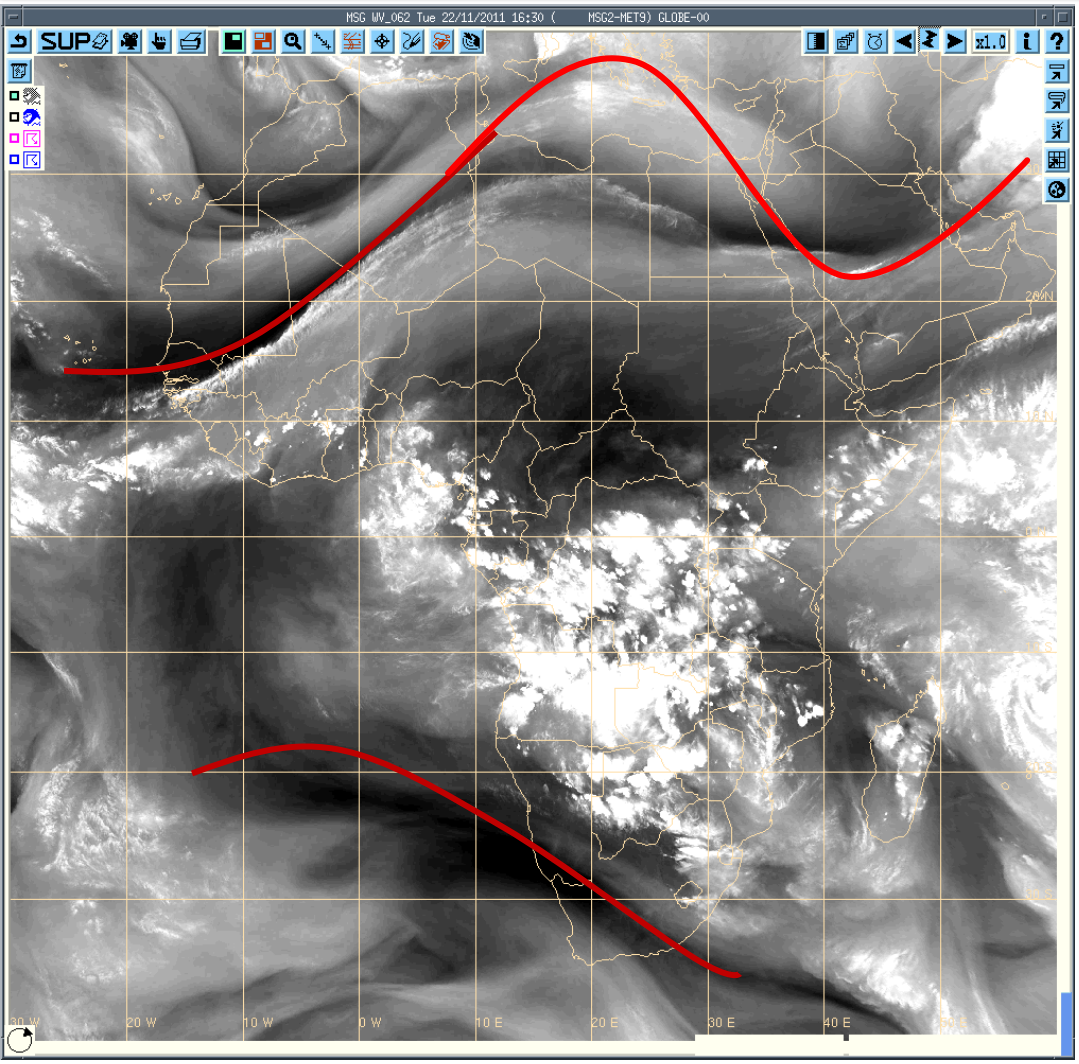
Overshooting Clouds

Step 8:Areas of deep convection RGb 10-9,9-4,9 (Night MicroPhysics)



1. Deep convection further west and Southern of Kenya except parts of Western
2. Deep convection of the coast of Somalia likely to hit the northern coast of the region.

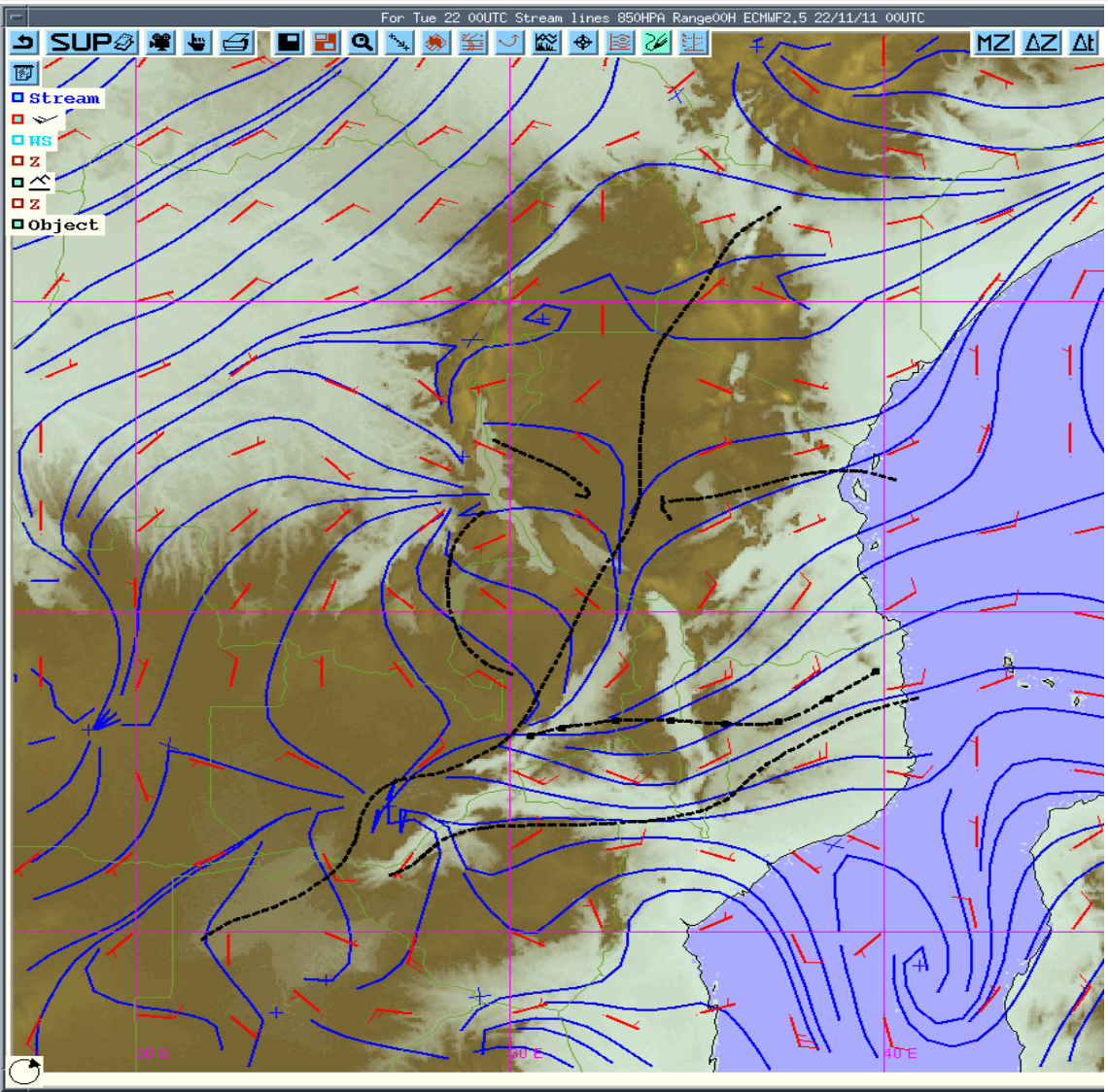
Step 10: WV5 and areas of Jetstreams



Positions of Jetstreams affects Weather by creation of strong outflows at the tropopause level ,necessary for Deep convection

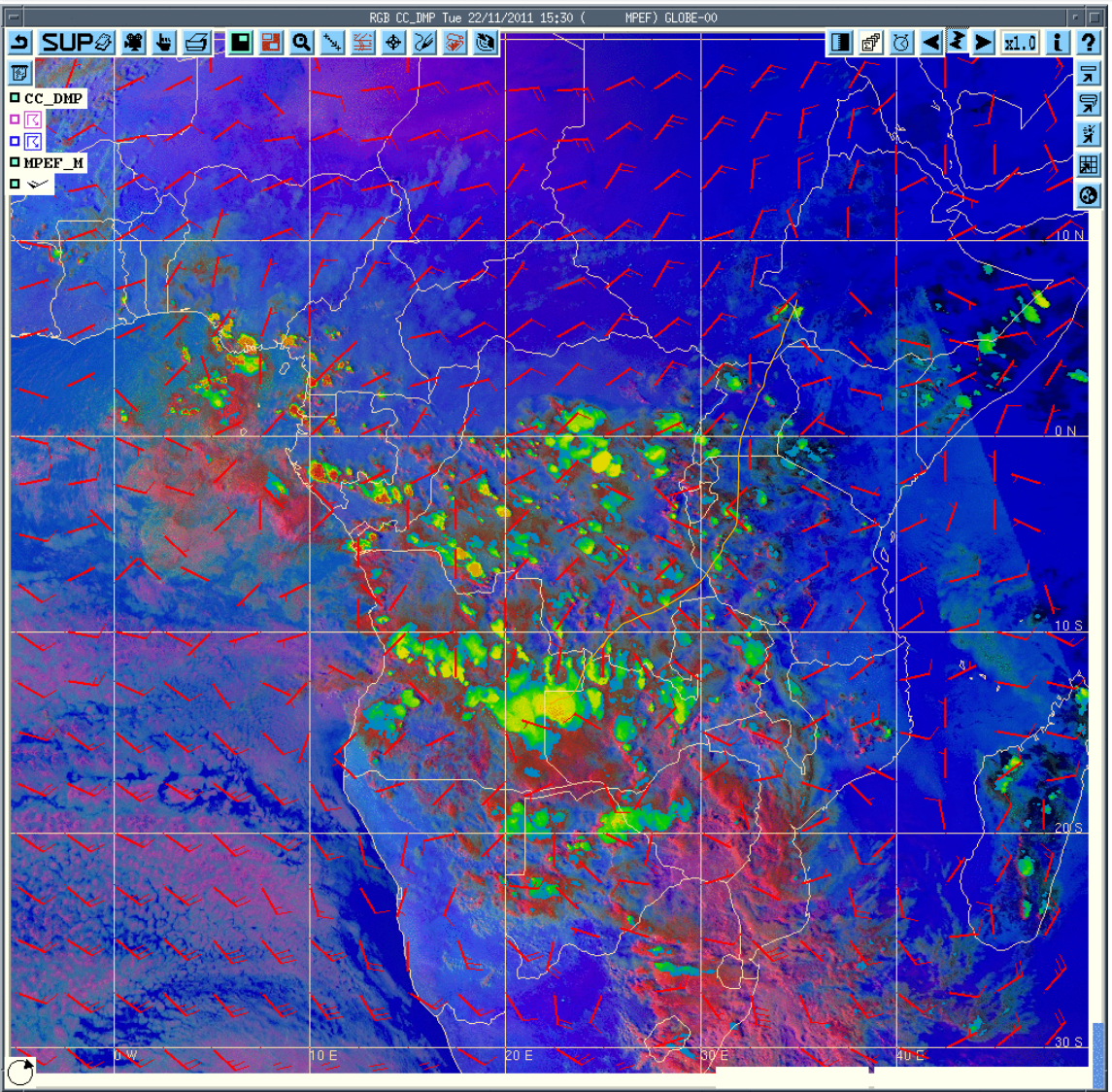
The Onset of seasons are associated with the intensity and the position of Jetstreams
E g. East Africa Low Level jet (July–September)

Step 11: ECMF2.5 ITCZ and Areas of confluence on 850 hPa wind :



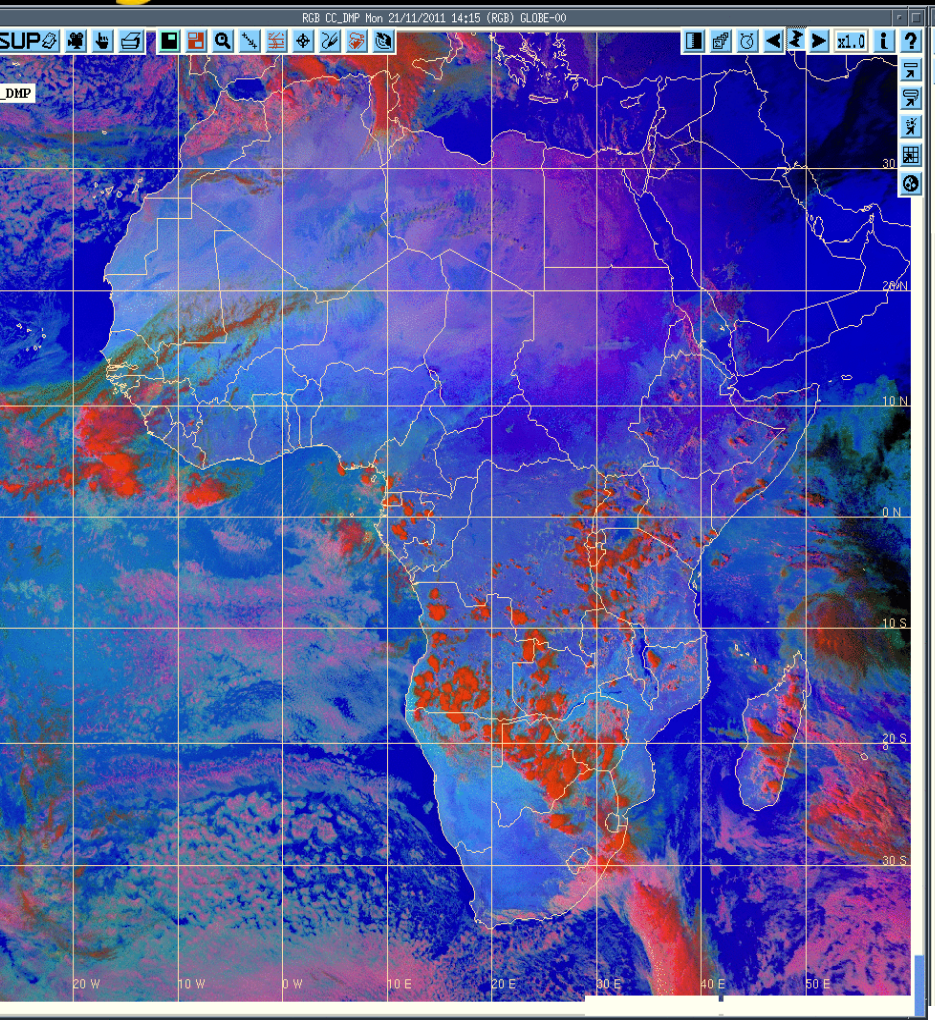
1. Satellite imagery confirms the identification of convergence zone by a belt of Cloud clusters.
2. Image analysis gives colours that depict the type of system and the stage of development

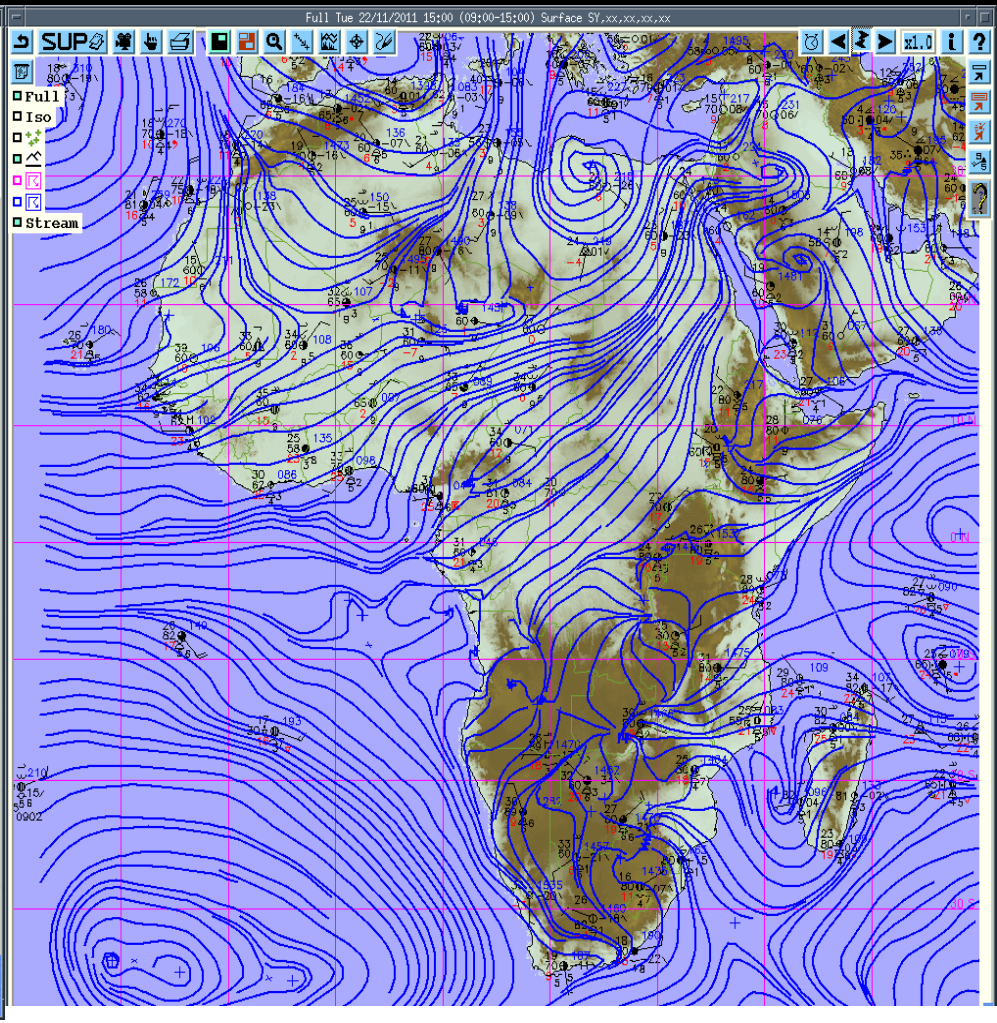
Step12: NWP wind at 850 Hpa overlay on DMP149 on (22.11.11)



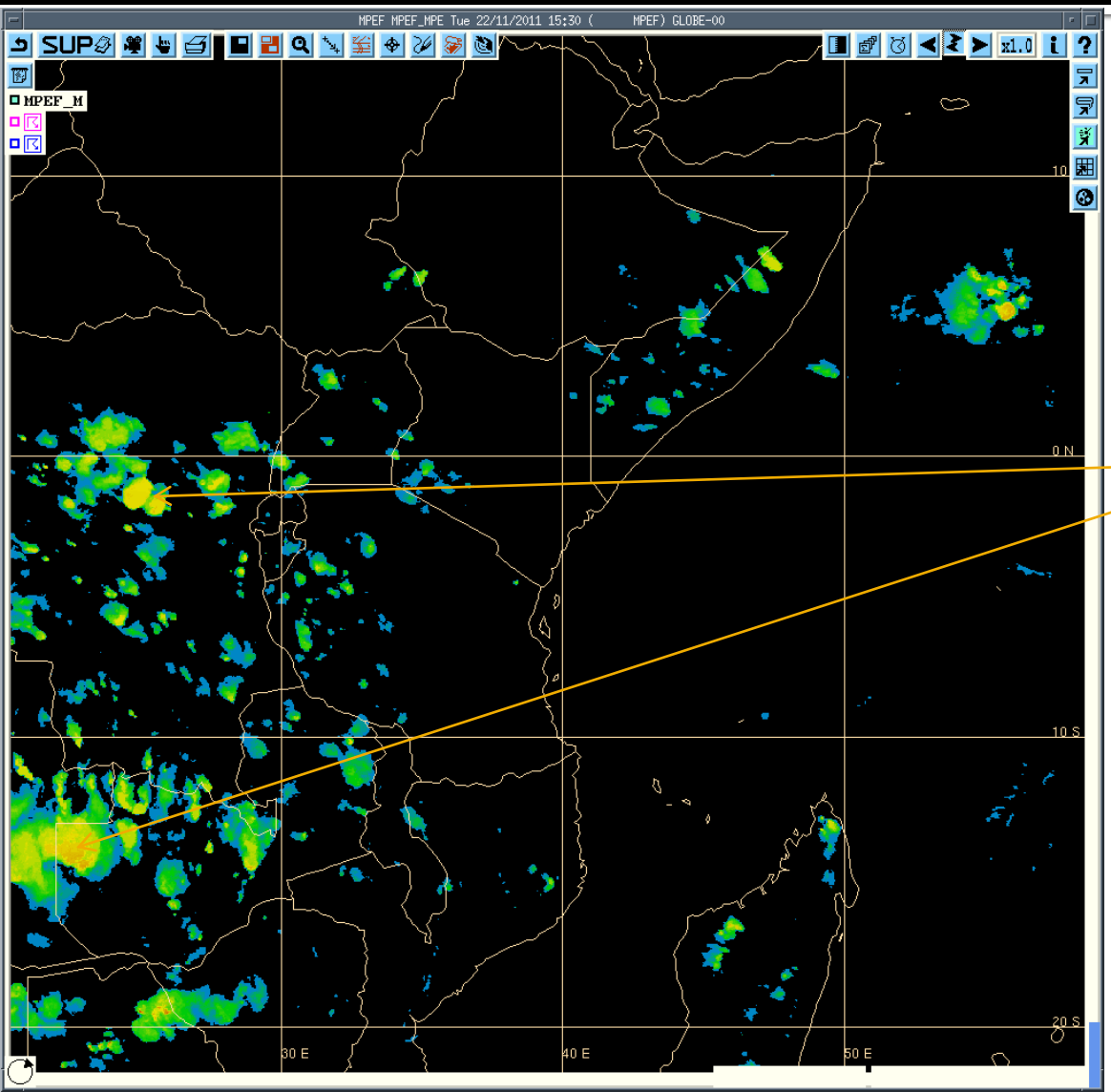
- Areas of low level convergence
- Corresponds with areas of deep clouds
- Causing High MPE values

Compare (dmp) RGB and NWP Wind 850 hPa





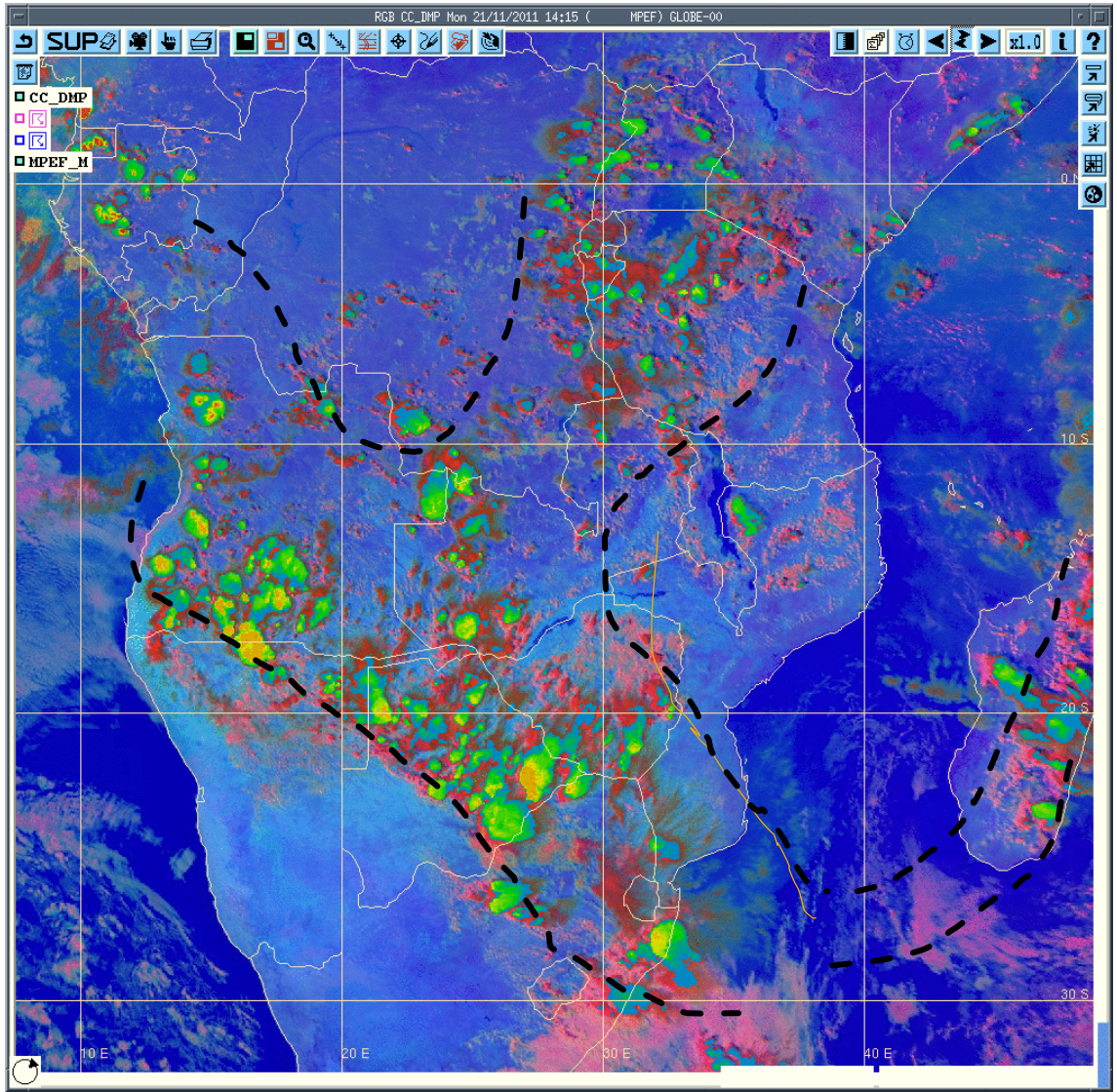
(22/11/11) MPE Rain estimate



1. Identification of remote rain rates

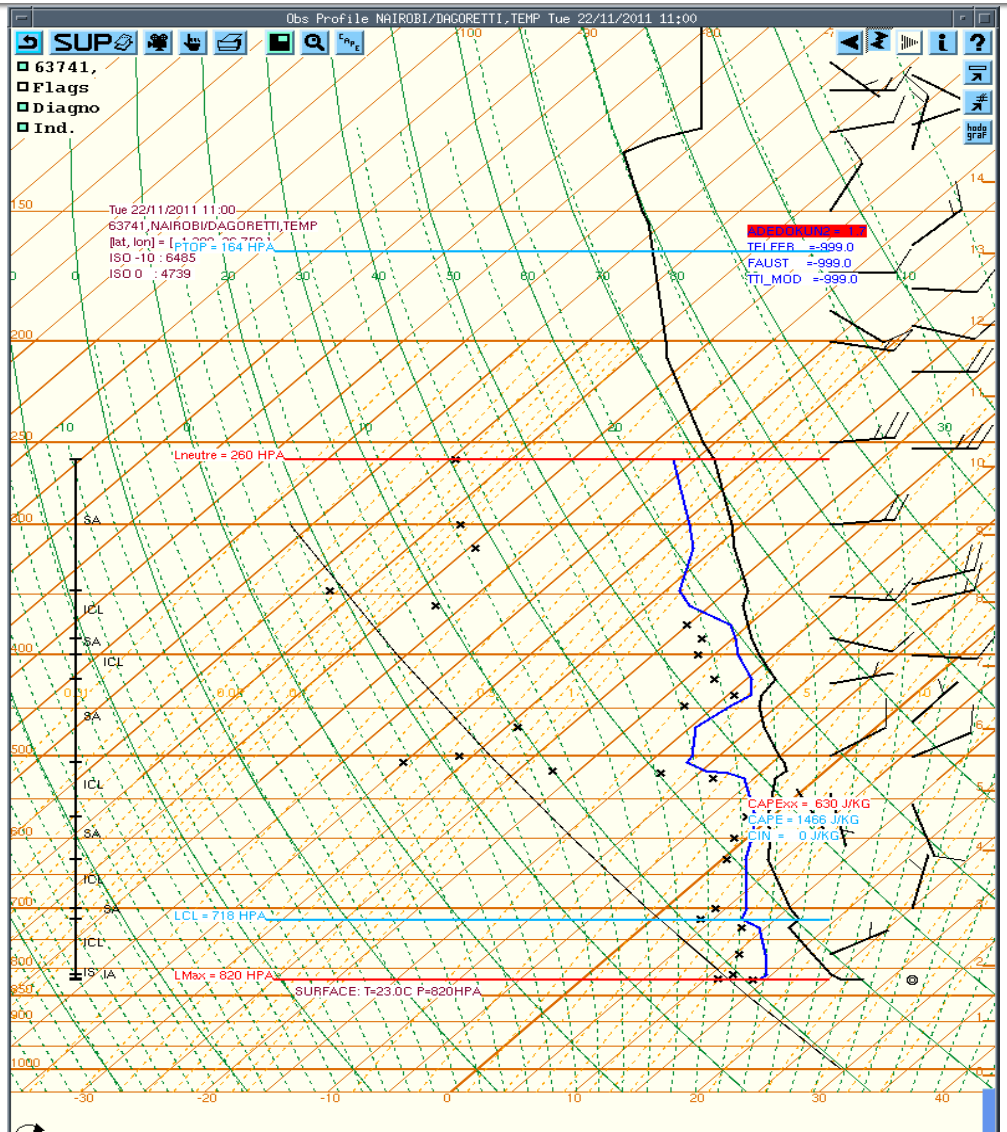
2. Areas of severe storm with heavy precipitation

MPE Overlay on day microphysics RGB



1. Areas of deep convection corresponds with areas of maximum rain rates and very active
2. Southern summer season.
3. ITCZ is mostly to the south spread over Congo basin and southern areas

Upper Air data for Nowcasting



Ascent analysis:

1. Very Unstable at lower levels. but dry at surface
2. Generally moist atmosphere but dry at column 500-450 hPa
3. Easterly Wind pattern conducive for afternoon WX activities

A summary of findings: Forecast

- The atmosphere is high unstable:
- There is sufficient supply of moisture within ITCZ zones and there is deep convection: WV (BTD)
- Therefore:
  - Showers and T/S over several places over Nairobi area and Highlands East .
  - Western Highlands will experience widespread showers and TS, NE,NW, SE and COAST sunny intervals in Lake basin: Heavy showers and TS most places. Flooding Alert! In Lake region