Operational use of the satellite data at Météo-France

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Media visit to MSG-3
Cannes, 07 March 2012

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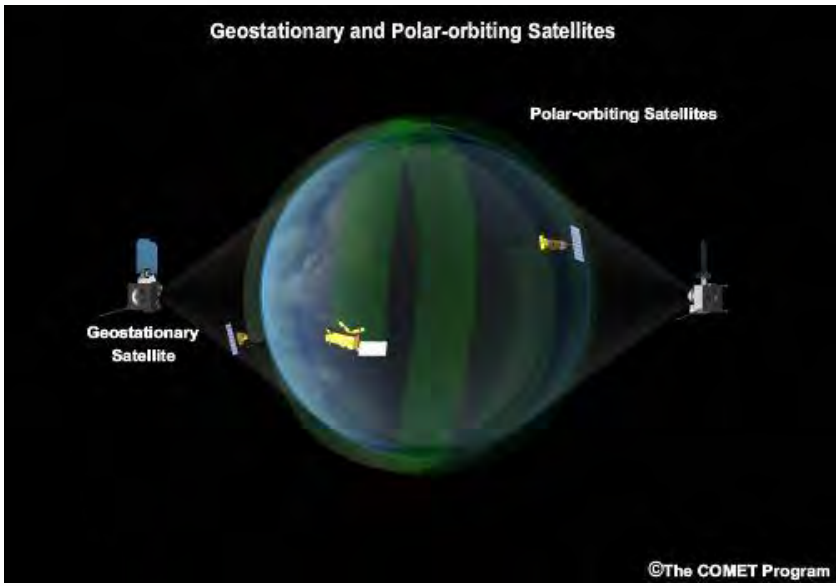
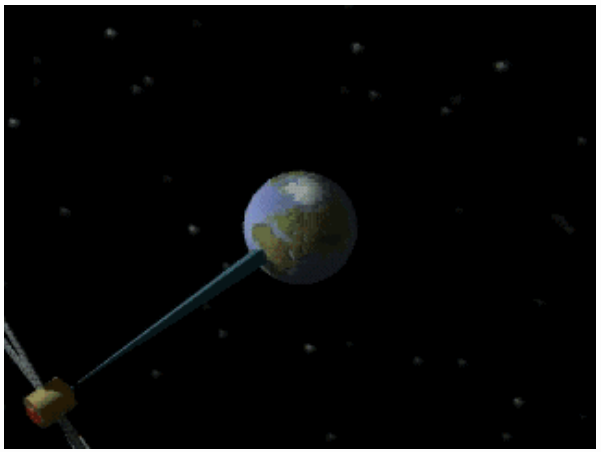
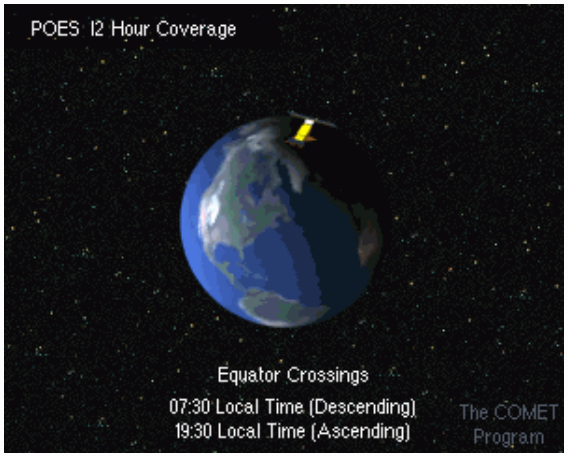
Two different kinds of satellite : geostationary and Low Earth Orbit (LEO) satellites



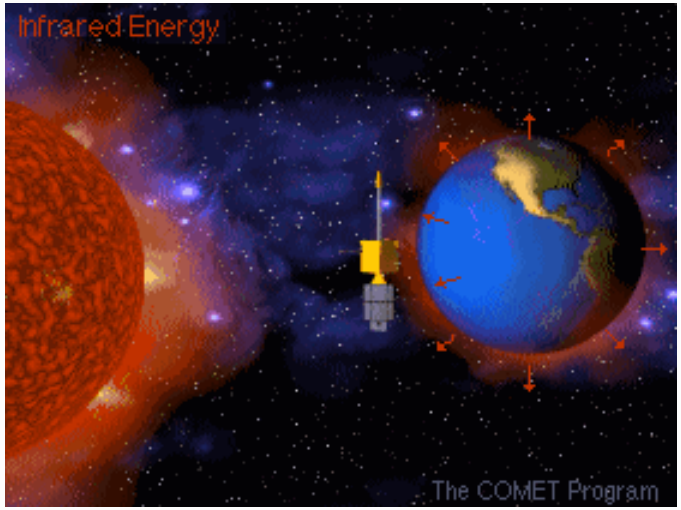




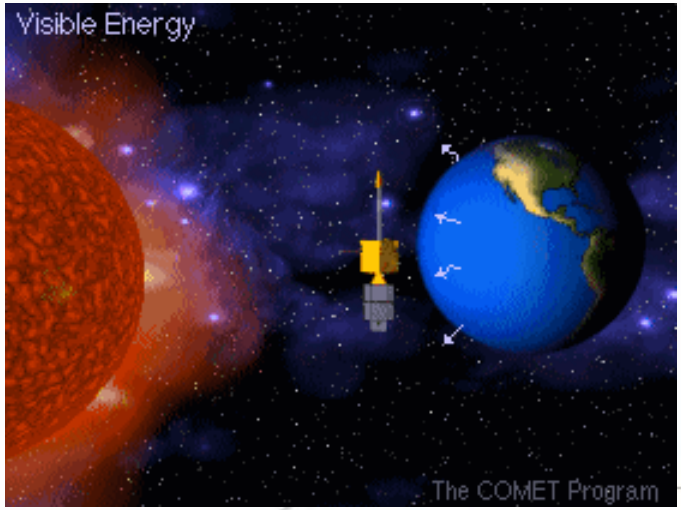
- LEO :
  - Altitude : usually about 800km
  - Higher resolution of the imagery
  - See the poles
- Geostationary :
  - orbits over the equator at the same rate that the Earth turns (altitude 36000km)
  - This allows the satellite to view the same geographic area continuously
  - Crucial to monitor the weather (an observation every 15' with MSG)

What do the satellites sense ?

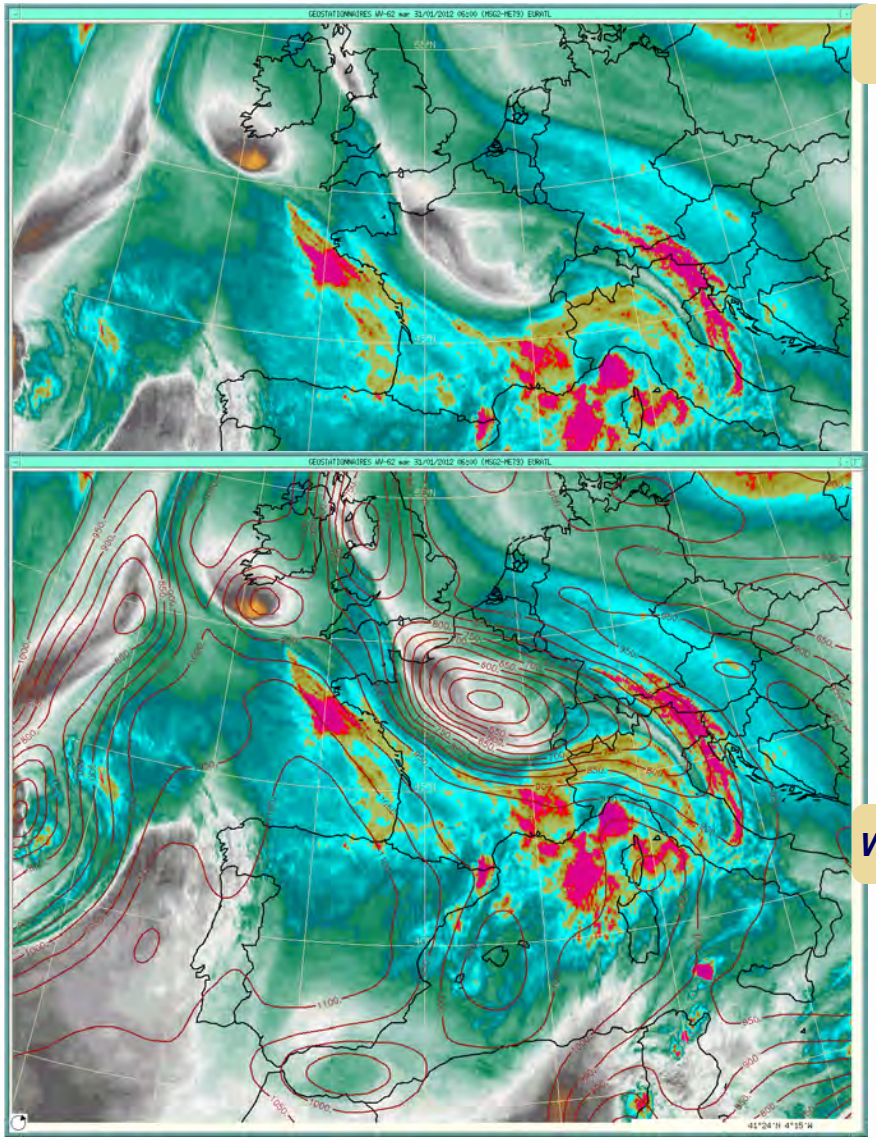
- **Infrared energy :**
  - The Earth's surface, clouds and atmosphere absorb and then re-emit part of the absorbed solar energy as **HEAT**
  - In infrared wavelength, the satellite senses **HEAT**
    - continuously.



- **Visible energy**
  - **The satellite senses the solar energy REFLECTED by the Earth**
    - Available only during daylight hours since sunlight is reflected only during that period



Adjustment of the Numerical Weather Prediction (NWP) products



Water Vapor imagery and color palette

- Superimposition of this product and Numerical Weather Prediction (NWP) products allows to:
  - check if the NWP is adjusted to observations
  - and therefore use the NWP for the forecasting

WV imagery + color palette + Numerical Weather Product

31 January 2012

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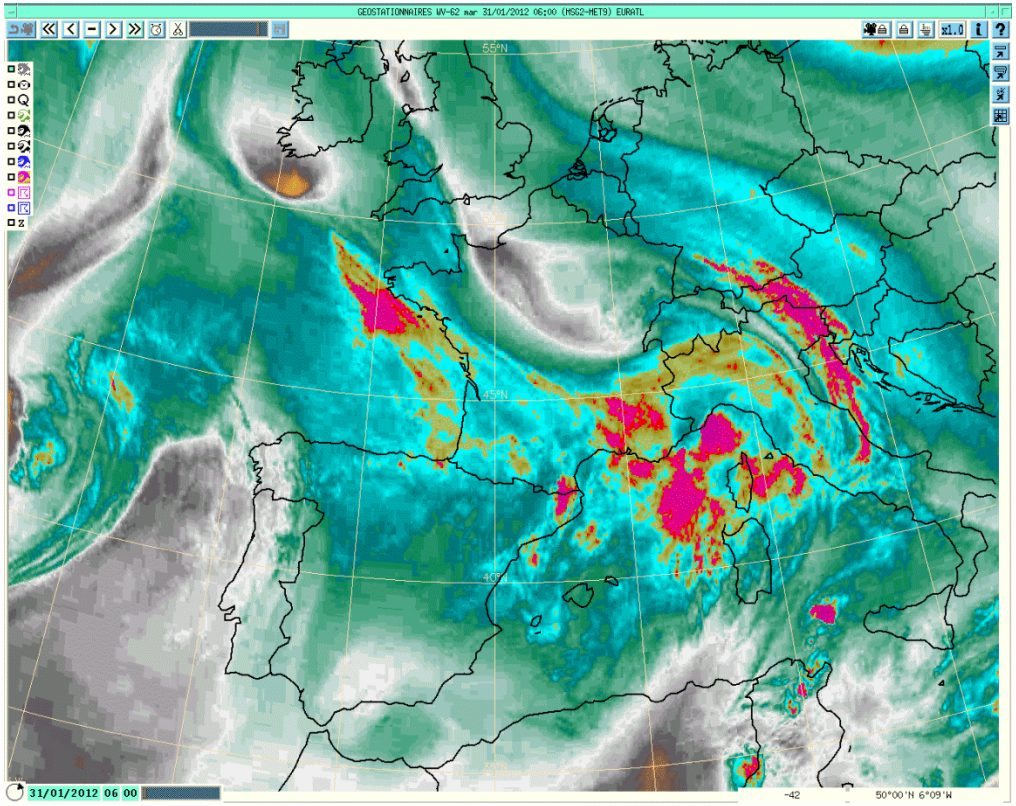
Tropopause folding monitoring



Water Vapor animated imagery and color palette

- Animated WV imagery provides information about
  - jet streams and tropopause folding movement (associated to the dynamism of a meteorological situation)
  - steering flows and windshear, useful for the tropical cyclones forecast.

01 February 2012

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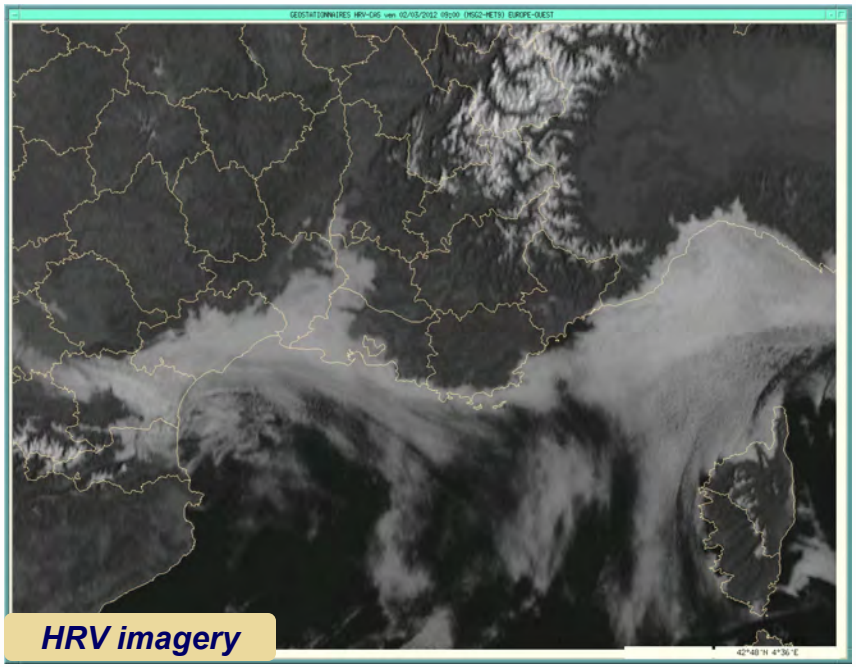
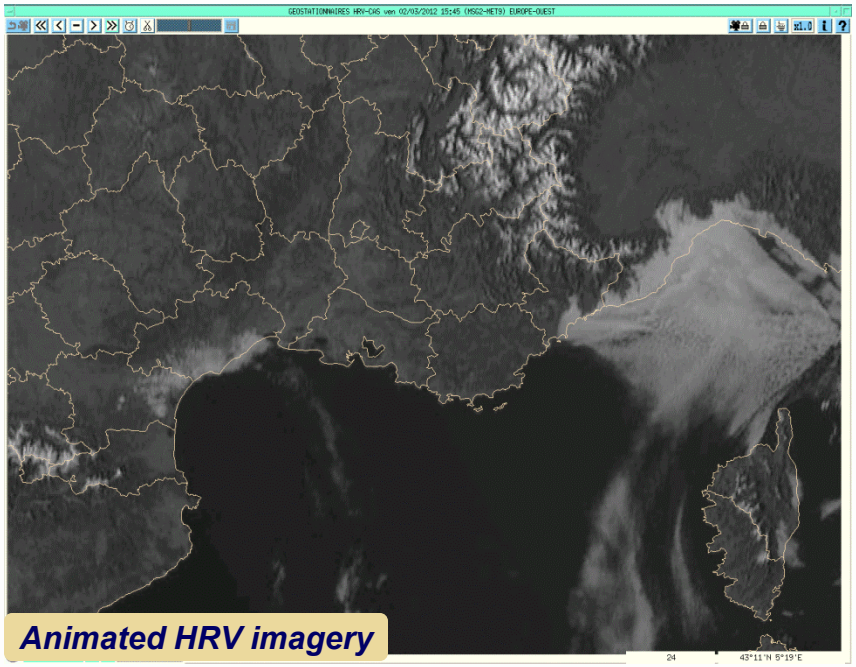
Low clouds monitoring and forecasting

Advection of marine clouds over Lion Gulf, southern PACA and western Corsica



HRV imagery



Animated HRV imagery

- Single channel High Resolution Visible (HRV) imagery perfectly shows the marine clouds

- … and animated HRV imagery shows perfectly the evolution of these clouds … during daytime hours …

02 March 2012

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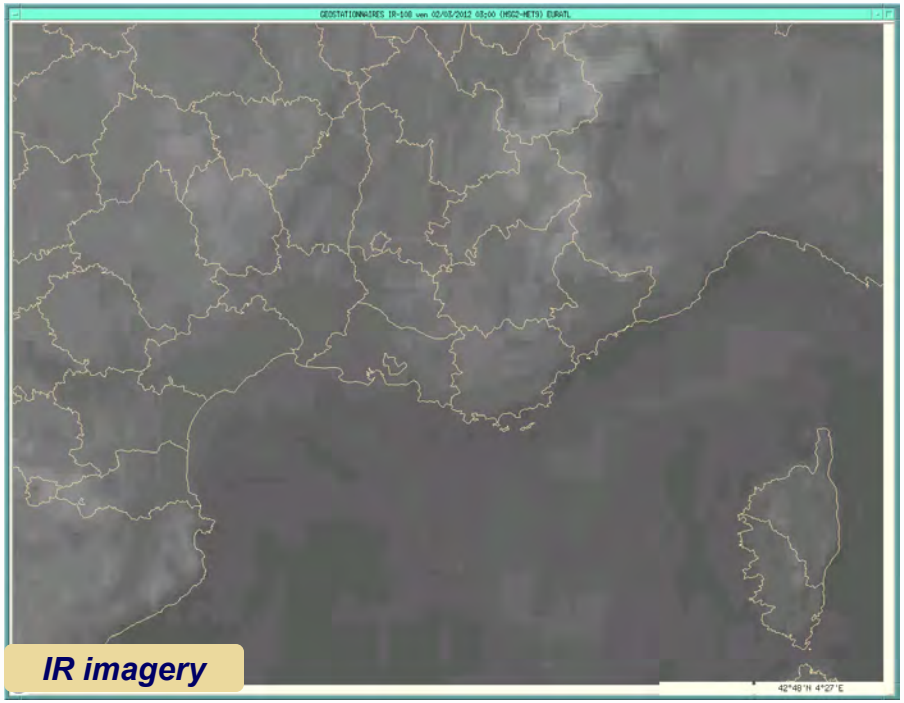
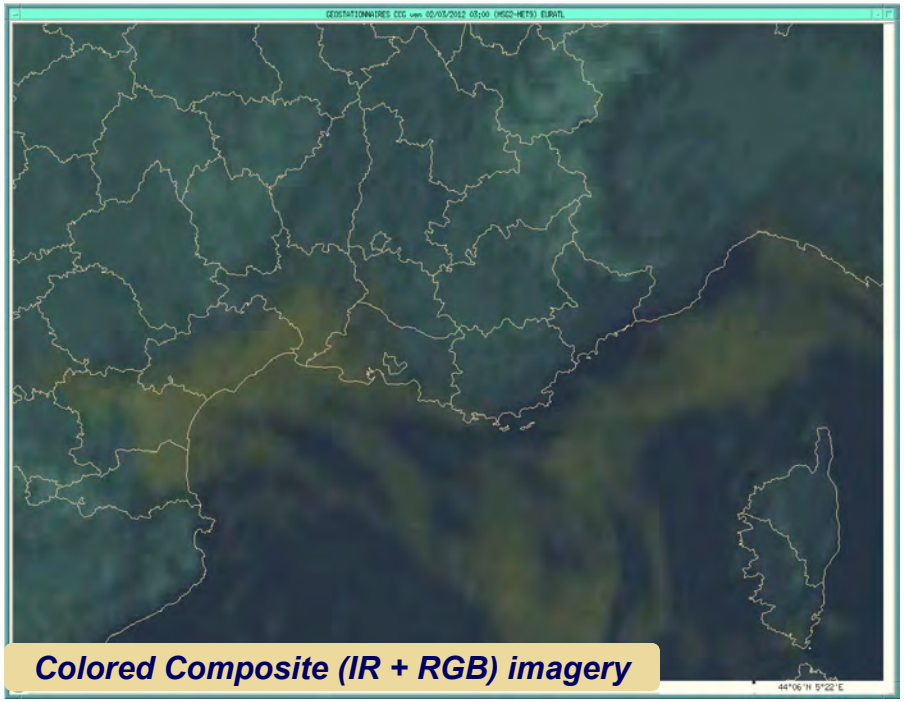
Low clouds monitoring and forecasting

Advection of marine clouds over Lion Gulf, southern PACA and western Corsica



IR imagery



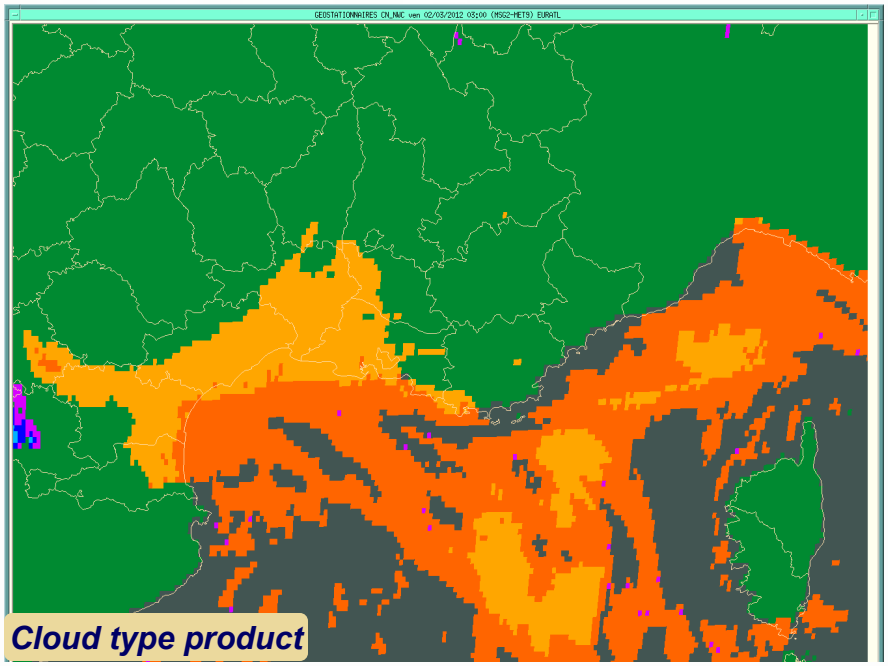
Colored Composite (IR + RGB) imagery

- … at night, single channel IR imagery is available, but visually not so useful

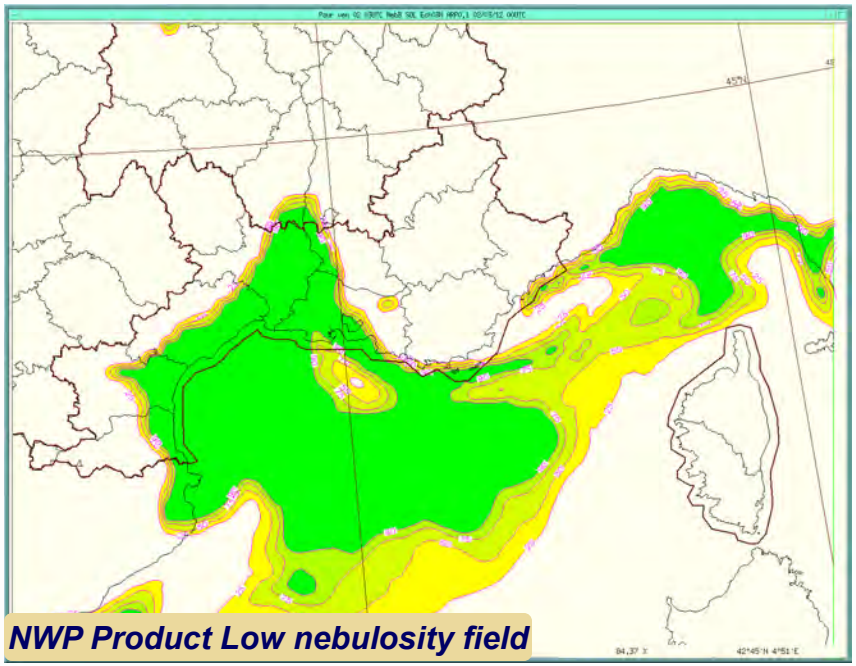
- CC imagery (IR + RGB) is visually better, but does not provide identification of cloud levels, nor defines clearly their coverage.

Low clouds monitoring and forecasting

Advection of marine clouds over Lion Gulf, southern PACA and western Corsica



Cloud type product



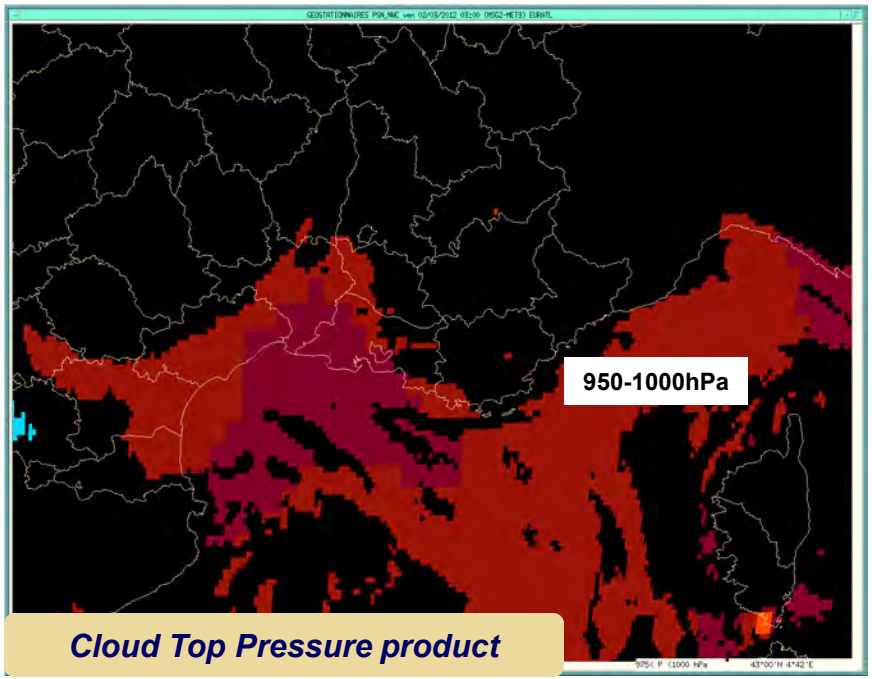
NWP Product Low nebulosity field

- Cloud type product imagery provides an identification of cloud levels, and clearly defines their coverage

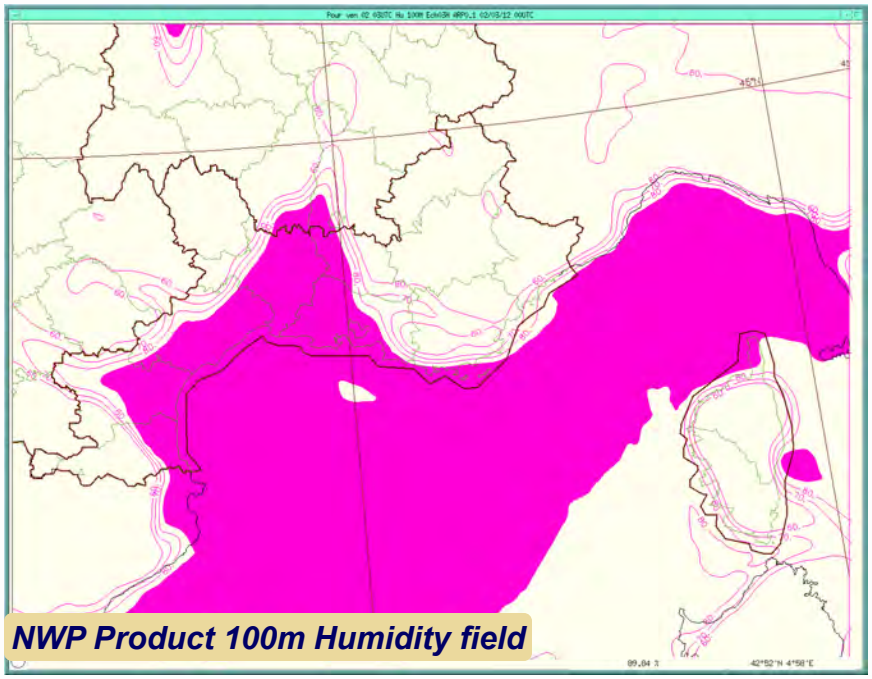
- Therefore the forecast fields can be compared and decision to be taken to use this field - or not - to forecast the evolution of these low clouds

Low clouds monitoring and forecasting

Advection of marine clouds over Lion Gulf, southern PACA and western Corsica



Cloud Top Pressure product

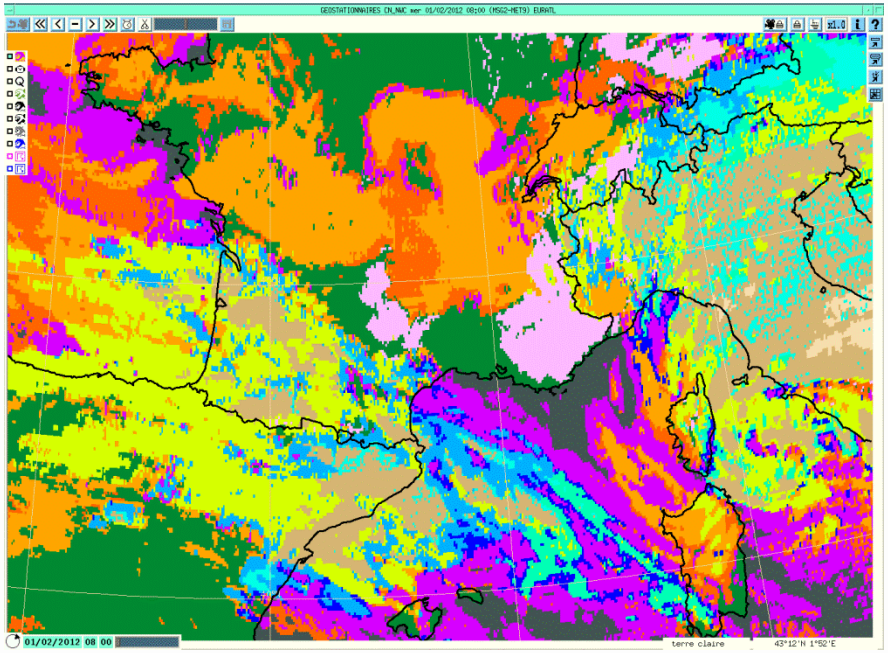


NWP Product 100m Humidity field

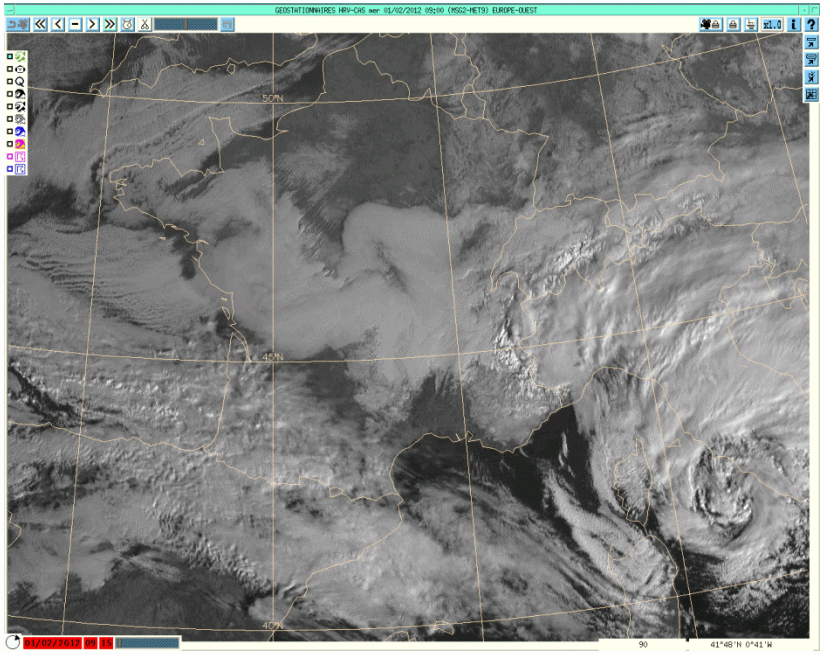
- Provides the pressure level at the top of the clouds.
- Therefore we know which level from the NWP products (wind field, humidity field) is useful to forecast the evolution of these low clouds.

Snow over the South of France

Identify the snow from the low levels or quite thin clouds, and its extension



Cloud type animated imagery



HRV animated imagery

01 February 2012

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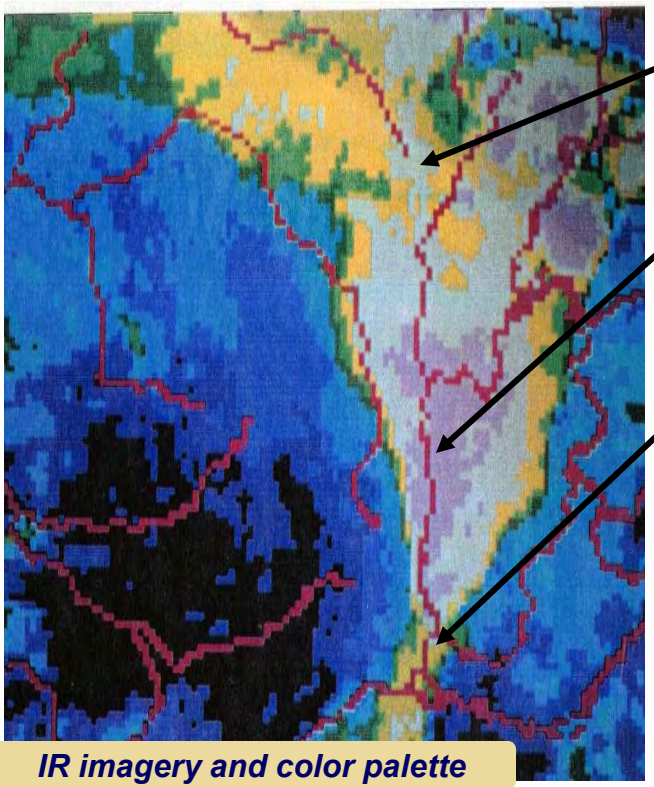
V-pattern convective system monitoring

A V-pattern Mesoscale Convective System,
looking like a smoke plume, easily depicted on the IR imagery.



IR imagery and color palette

Downstream, a warmer area

A very cold area : overshoot, due to a maximum of convection

The 'V' pointes towards the direction the wind comes from at mid-troposphere (700 à 500 hPa)

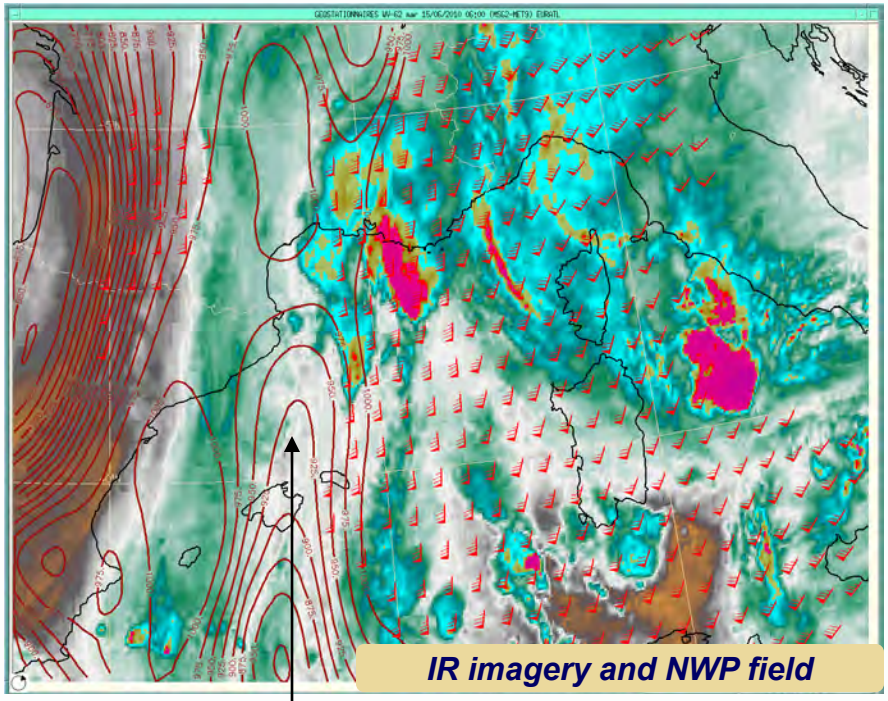
- Signature of a potentially dangerous system : stationary system, with potentially huge rainfall totals

Direction of the wind at mid level

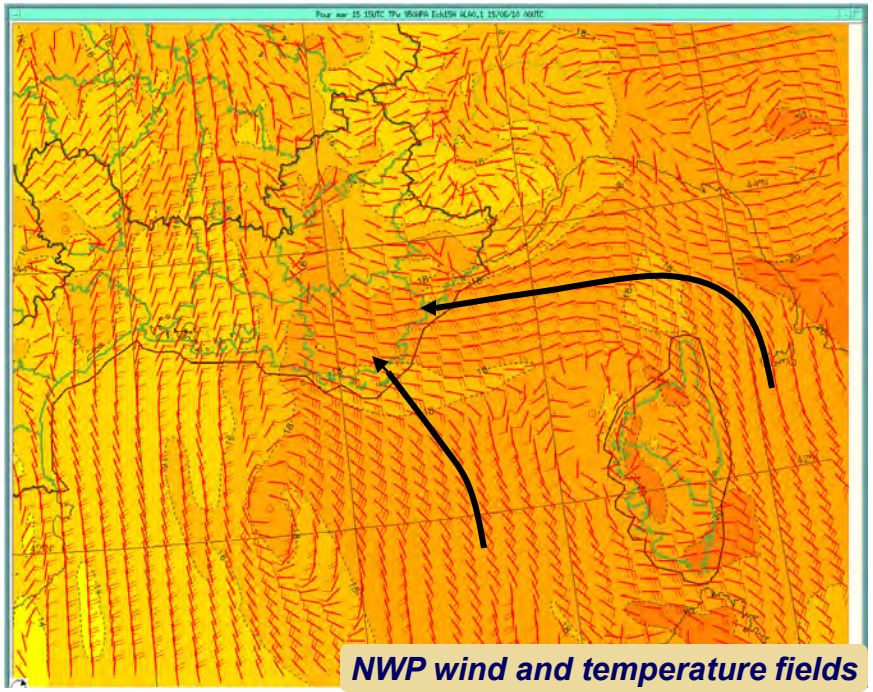
Source: L. Goulet

V-pattern convective system monitoring

Environment of the MCS developing the 15 June 2010



IR imagery and NWP field



NWP wind and temperature fields

- At upper level, a small tropopause folding … but it will be enough to boost the system at its first stage

- At low levels, well established and warm inflow from the sea towards the continent; low levels energy

V-pattern convective system monitoring

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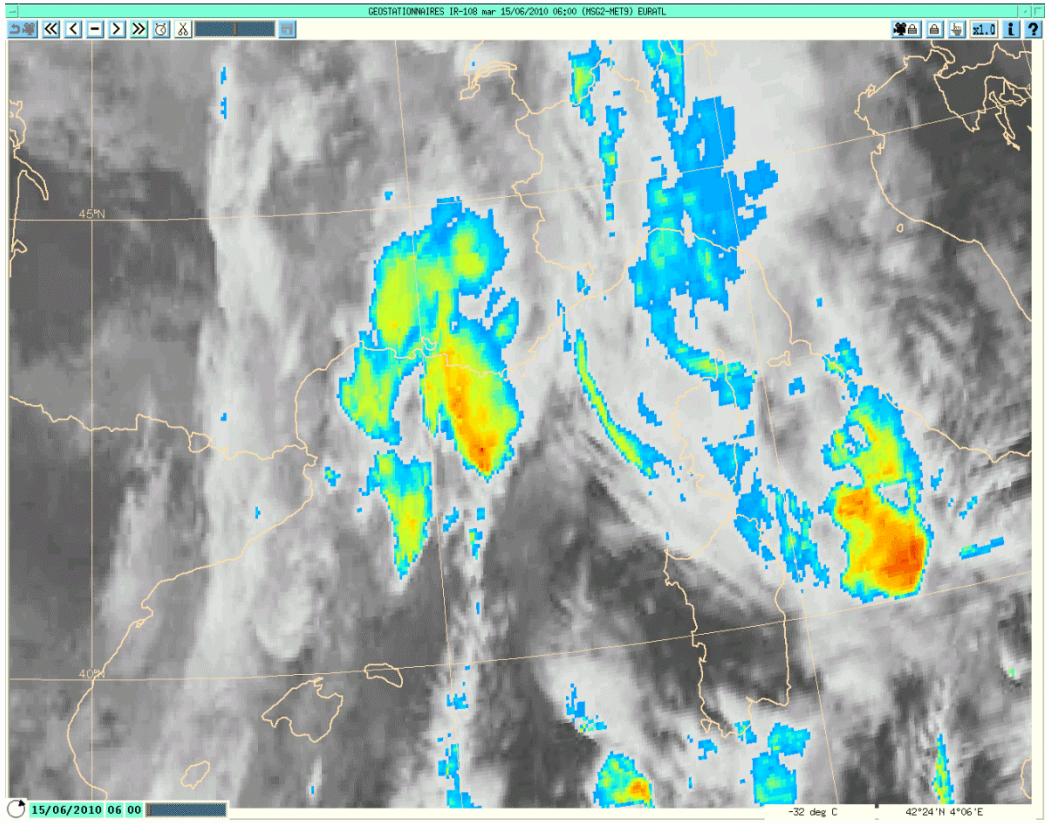
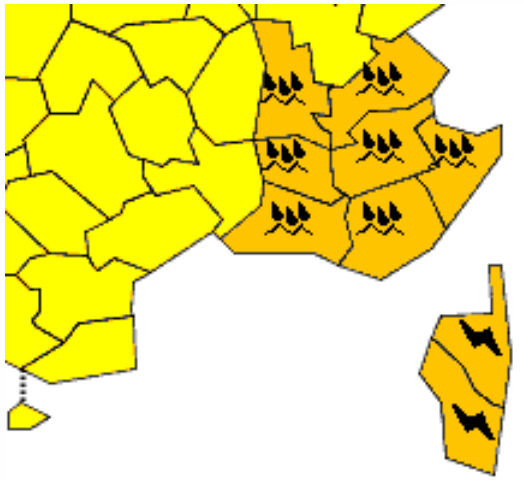


Animated IR imagery and color palette



Watch map the 15th at 16h

- In less than 12 hours
- 25% of the Var area: rainfall total superior to 200 mm
- Locally more than 400 mm (for comparison, annual rainfall total in Paris: 640 mm)
- 25 dead and lots of damages

15 June 2010

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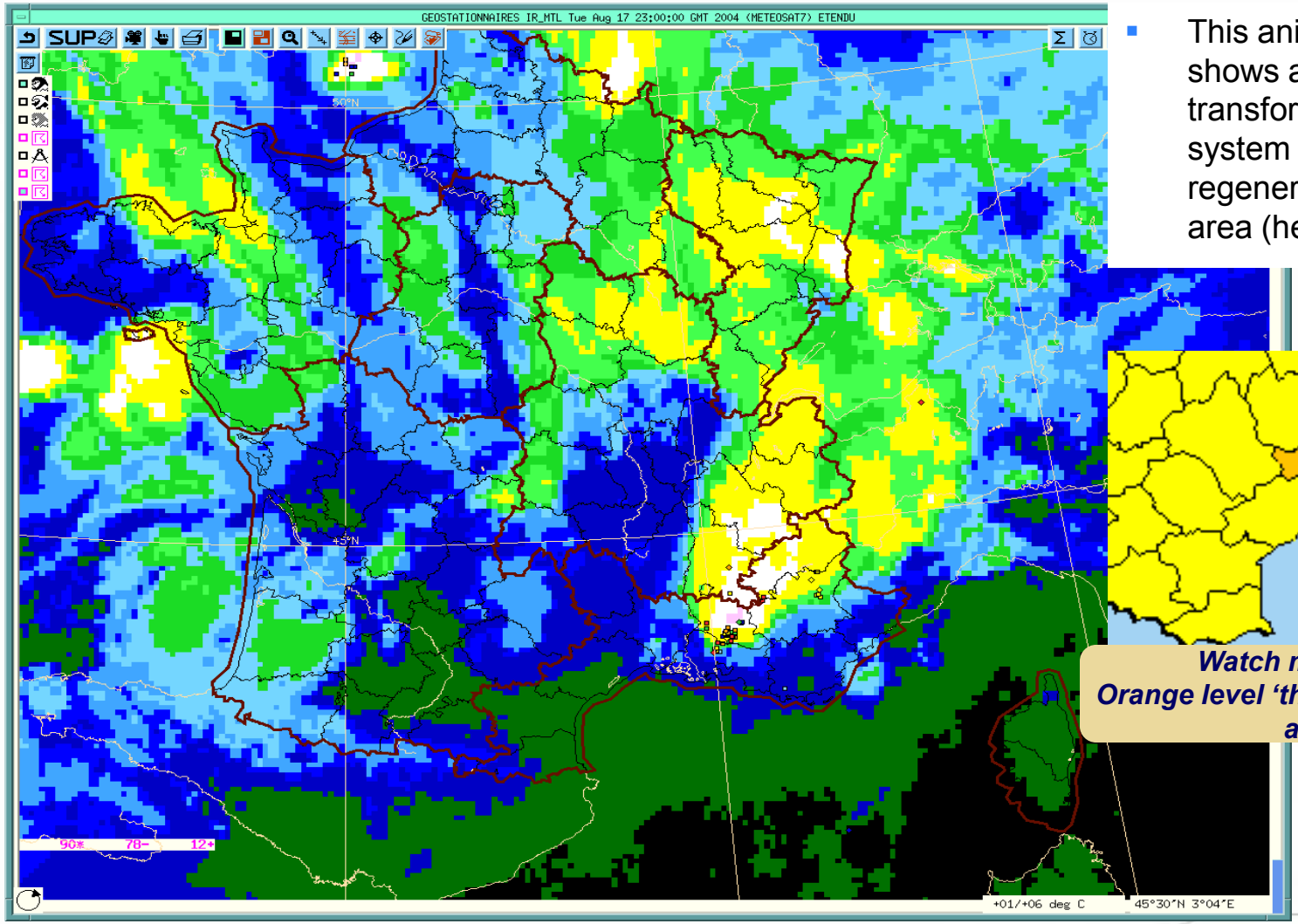
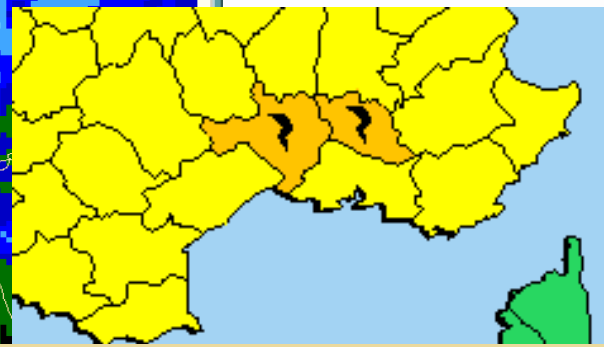
V-pattern convective system monitoring



- This animated IR imagery shows a MCS case transforming from a mobile system to a stationary one, regenerating over the same area (here the Gard area)



Watch map the 18th at 00h
Orange level 'thunderstorms' for the Gard and Vaucluse

Source: L. Goulet

17-18 August 2004

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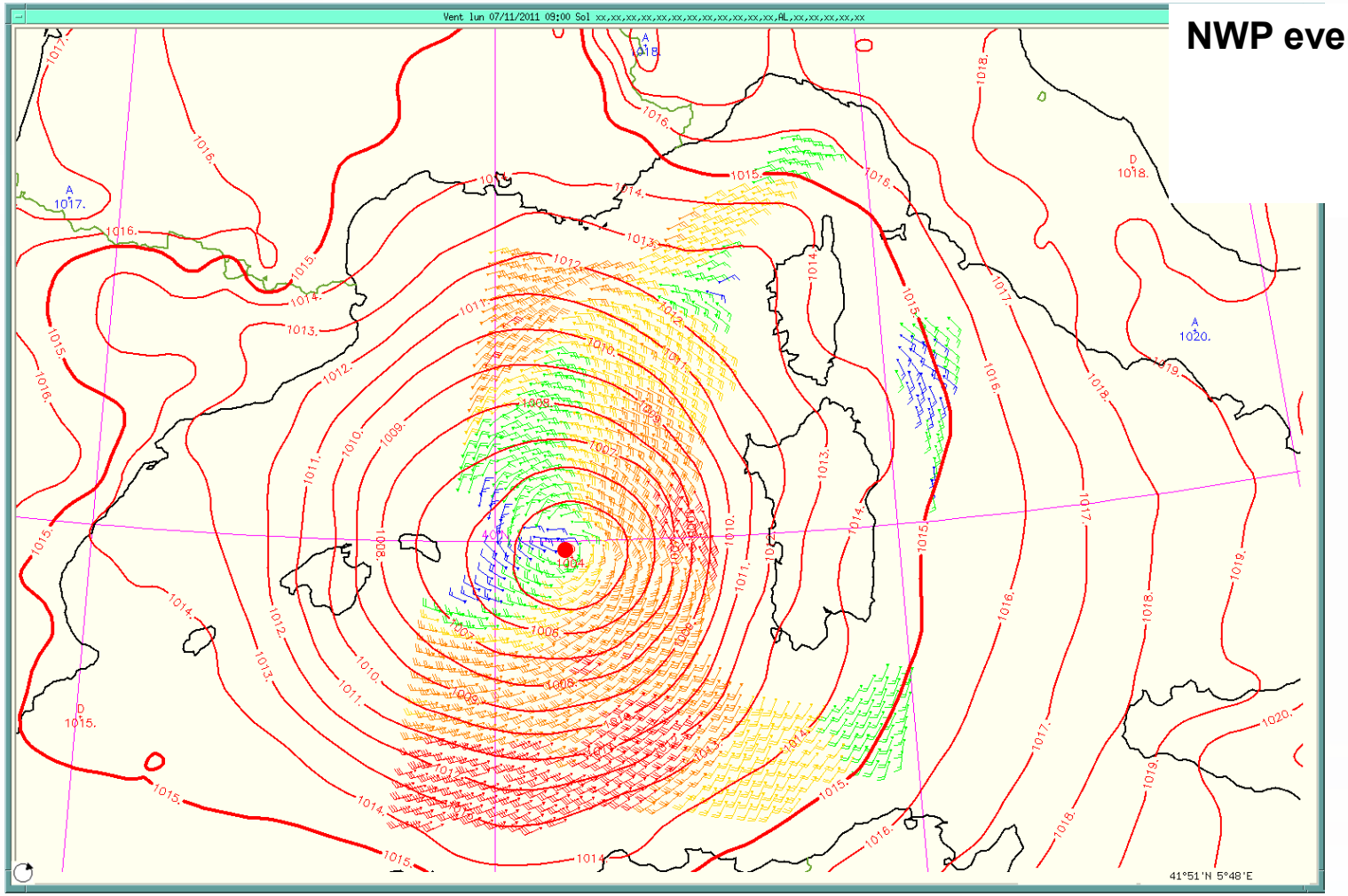
Storm monitoring and forecasting



NWP even better

Medicane, 7 November 2011

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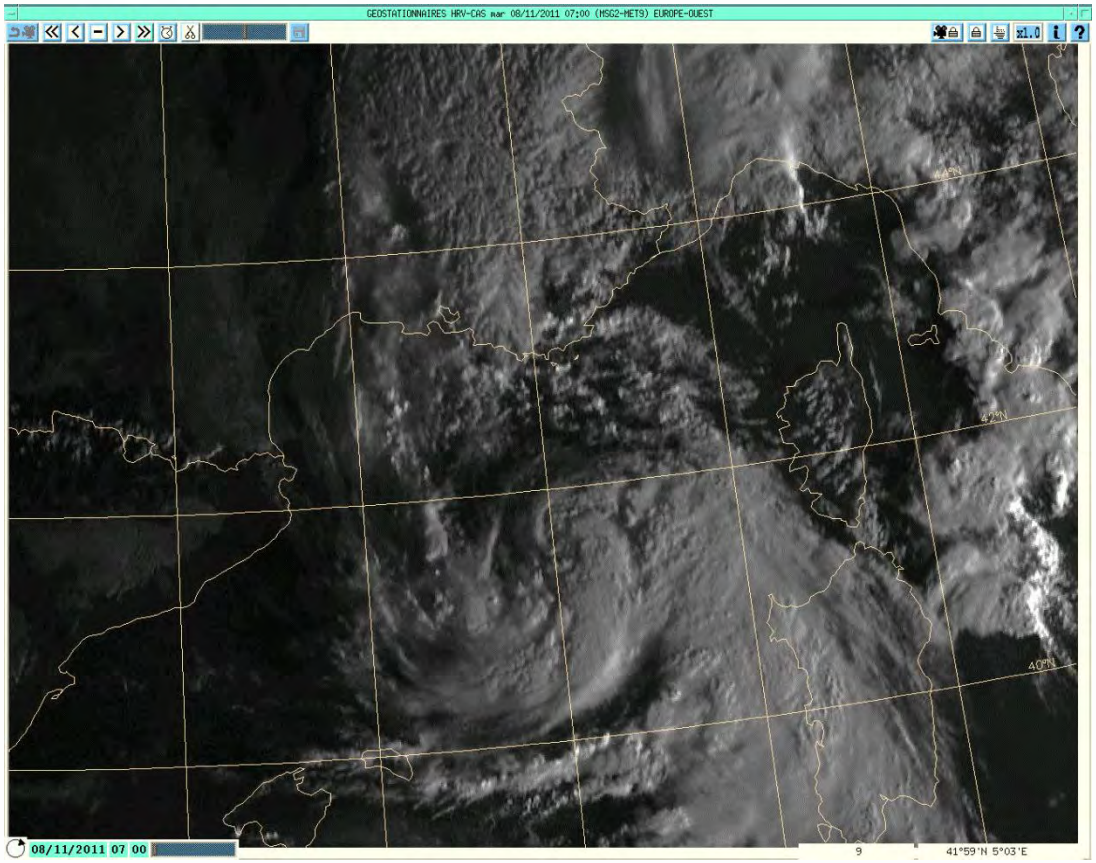
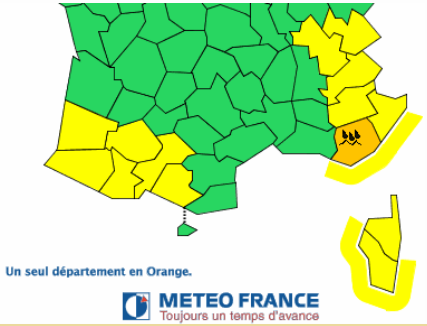
Storm monitoring and forecasting



Animated HRV imagery

Medicane, 8 November 2011



Watch map the 8th at 11h
Orange level 'rain and inundation' for the Var

- Animated HRV imagery showing the evolution of the medicane

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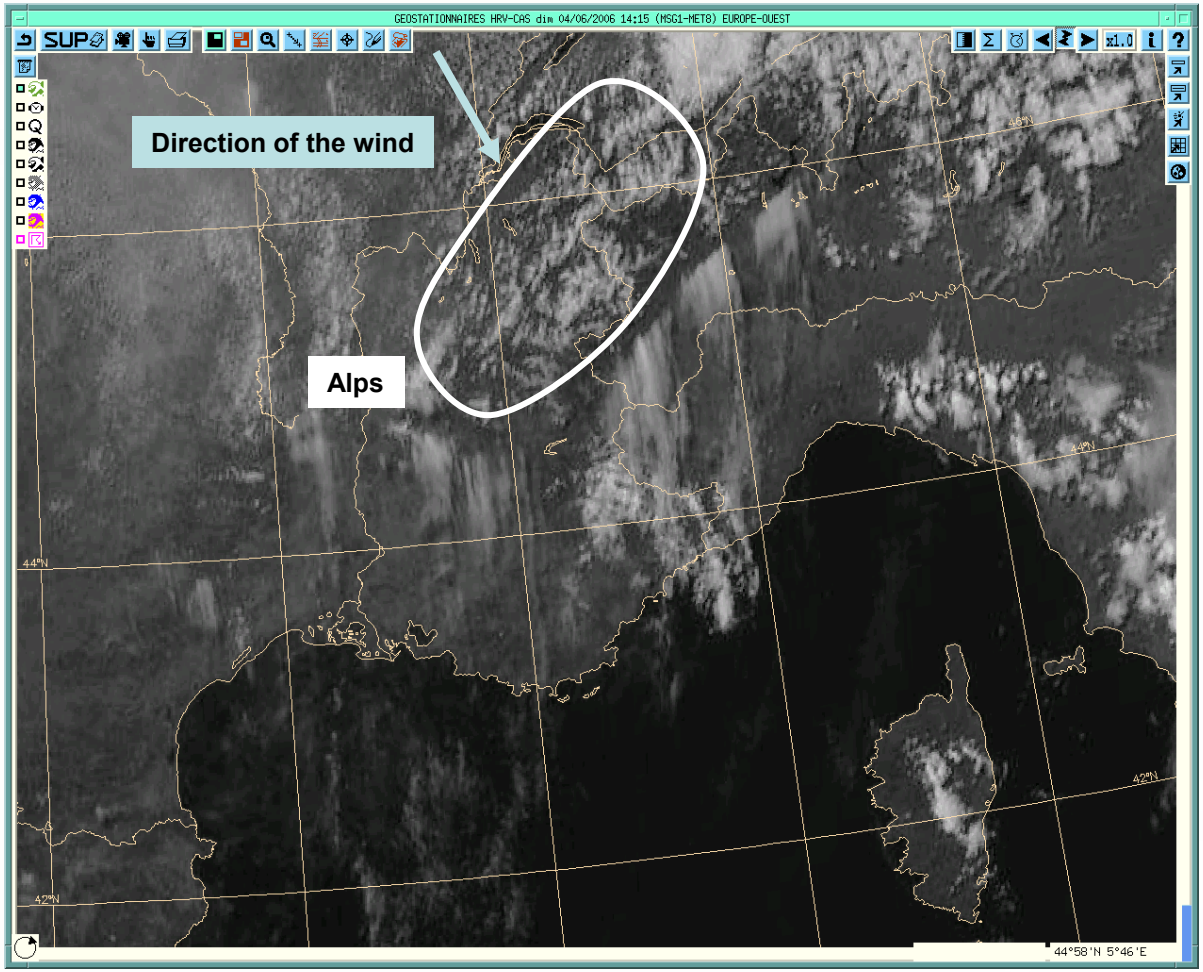
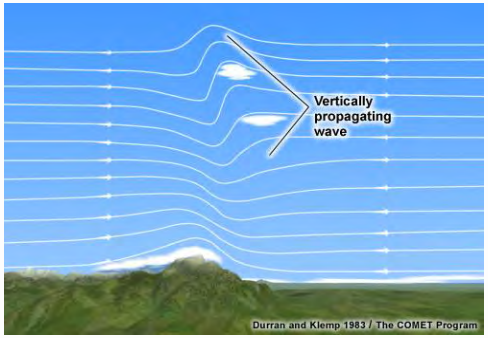
Mountain waves monitoring

Propagating waves



HRV, Visible High Resolution

4 June 2006



- Plumes of cirrus clouds, leewards.
- These patterns prove the existence of propagative waves
- Risk of downslopes winds, strong gusts, turbulences -> aeronautic forecasting

Source: L. Goulet

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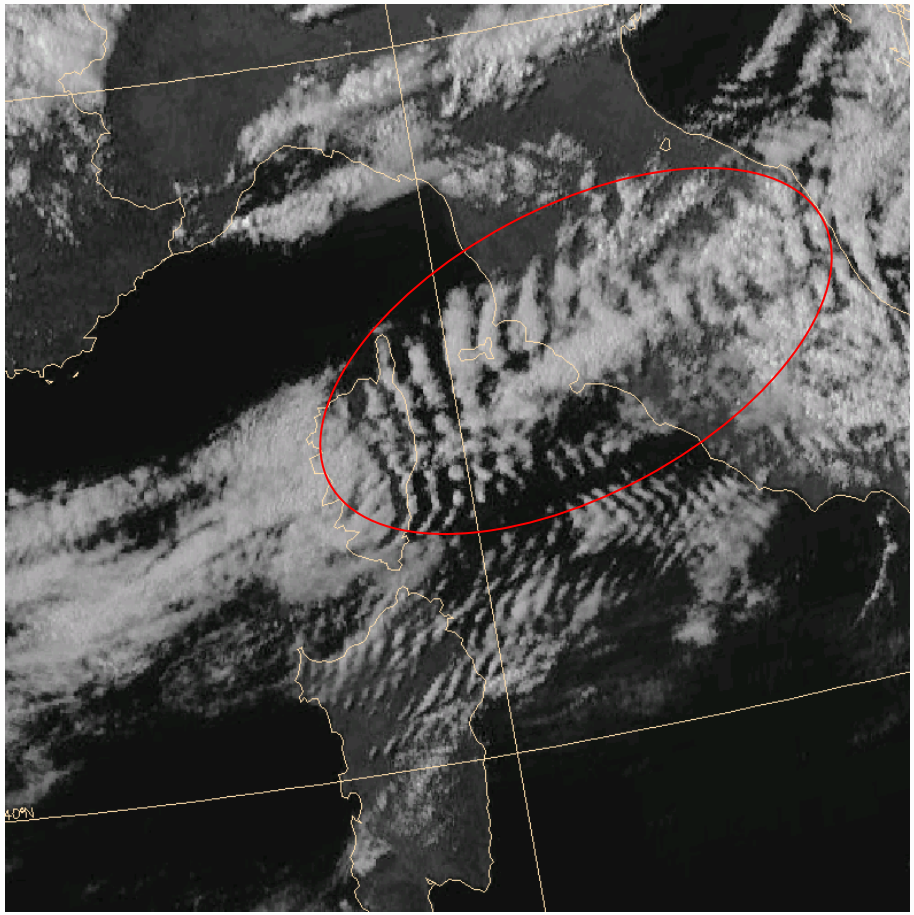
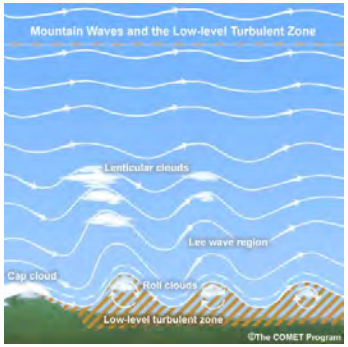
Mountain waves monitoring

Lee waves



HRV, Visible High Resolution

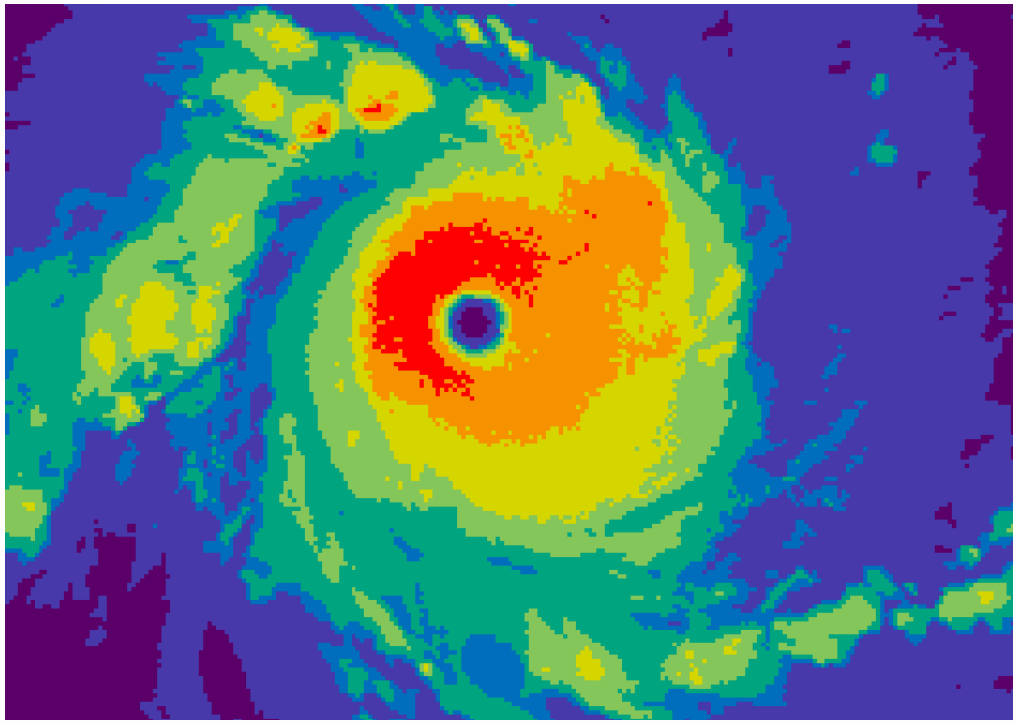
4 July 2007



- the lee wave develops at each wavelength some ascendant movements
- produces cloudy bands, more or less parallel and equidistant
- Impact the weather forecasting and the aeronautic forecasting (produce rotors and therefore turbulences).

Source: L. Goulet

Tropical cyclone monitoring



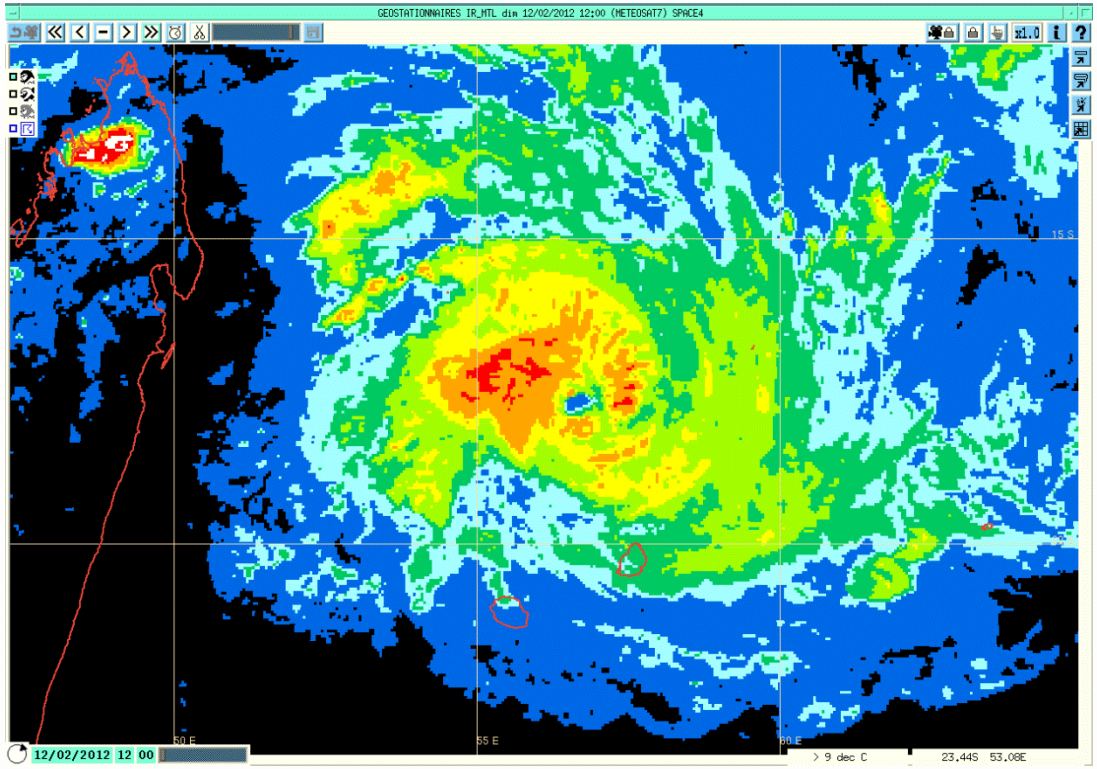
Infrared imagery and Dvorak Palette

Kalunde, 8 March 2003, 0230Z

- IR imagery + Dvorak color palette, so-called from the 'Dvorak Technique'
- Imagery used at the Tropical Cyclones Center La Reunion to estimate the intensity of the tropical systems, thanks to the 'Dvorak Technique'.

Tropical cyclone monitoring

Intensification of TC Giovanna



Infrared animated imagery and Dvorak Palette

- Shows the formation of a well-defined eye as system Giovanna intensified from a ‘tropical cyclone’ to ‘intense tropical cyclone’ in the vicinity of the Mascarenes Islands over the Indian Ocean.

Giovanna, 12 February 2012

Source: P.Caroff

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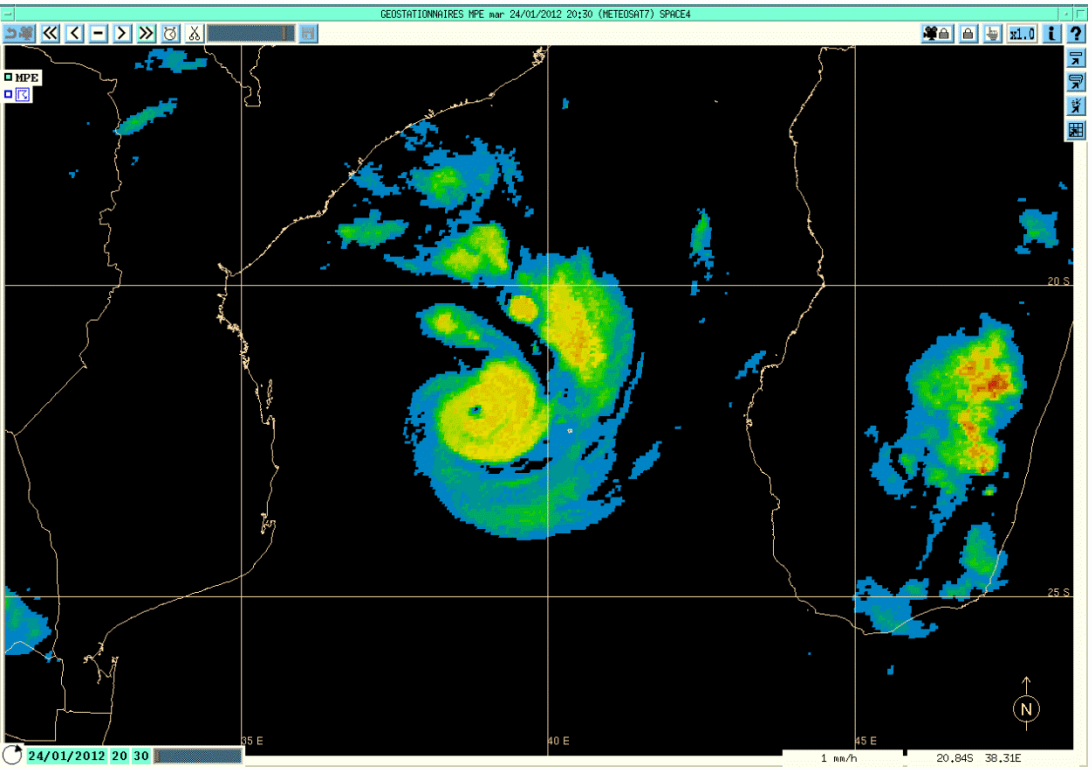
Tropical cyclone monitoring

MPE : Multi-Sensor Precipitation Estimate during Funso's Eye Cycle



- Tropical Cyclone FUNSO over the Mozambique channel
- No radar coverage available in this area
- Shows an Eyewall Replacement Cycle (Eye Cycle), leading to a weakening following by an intensifying of a tropical cyclone, when completed.
- The MPE gives an estimation of the Precipitation Rate in mm/h in the rainbands and in the eyewall

Multi-Sensor Precipitation Estimate

Funso, 24-25 January 2012

Source: P.Caroff

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Thank you for your attention

In collaboration with
Meteo-France
Interregional Directions
at La Réunion and Bordeaux

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