Case Study of Satellite tracking of the 31st December 2005 warm sea effect rains in Northern Oman

Khalid Khamis Saif Al-Jahwari

Assistant Director of Forecasting and Observing Practices

DGMAN, Oman

Interpretation of WV imagery

- In a normally moist atmosphere, most of the WV radiation received by the satellite originates in the 300–600 hPa layer, but when the air is dry some radiation may come from layers as low as 800 hPa.

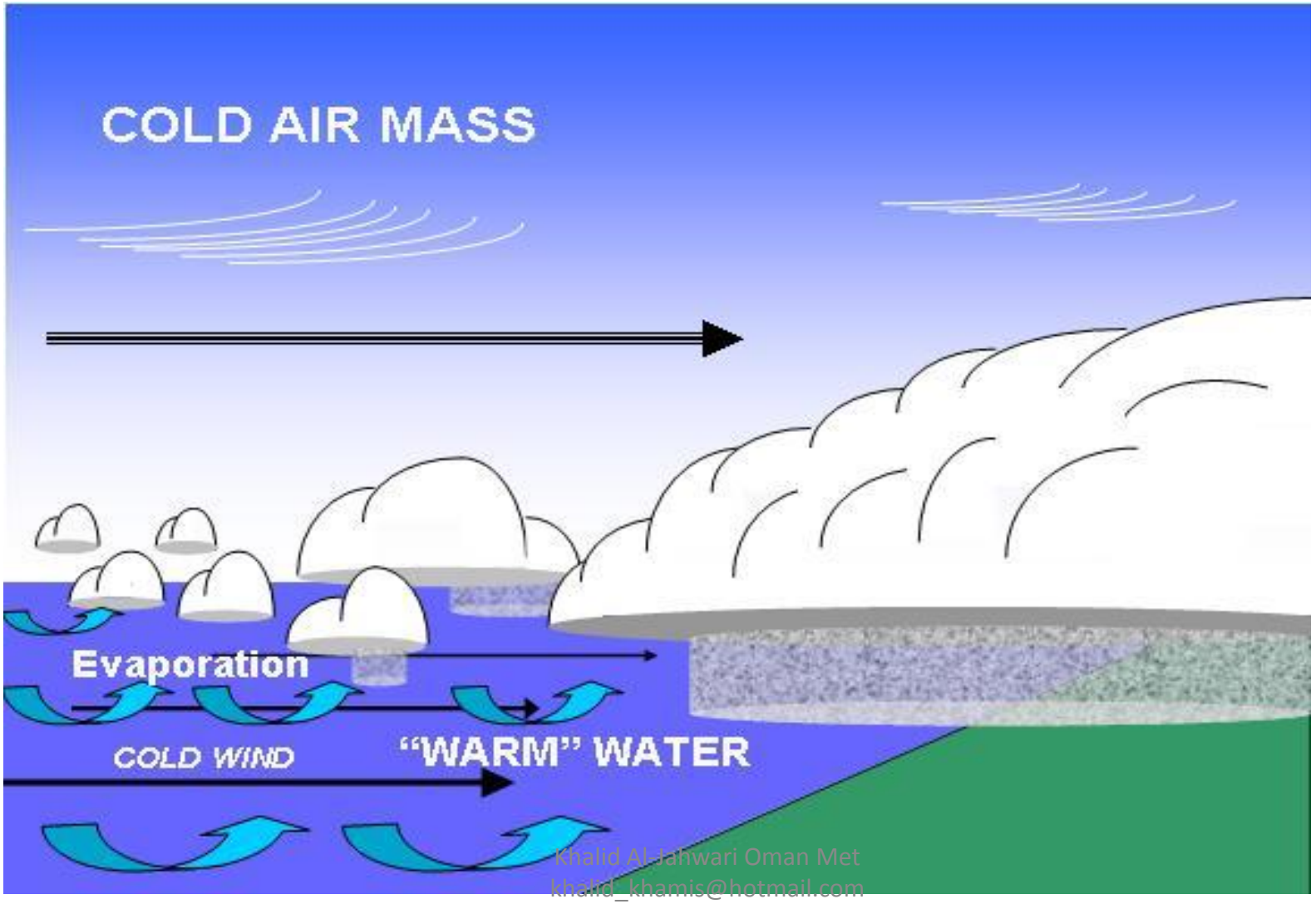
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

- It is particularly important to note that even when a WV image indicates a very dry upper troposphere, there may well be moist air near the surface.

- Moist air or cloud in the lower half of the troposphere is not depicted well in WV imagery.

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Warm Sea Effect Rain



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Warm Sea Effect Rain

- Occurs when cold air passes over relatively warm sea and picks up moisture and heat.
- The intensity of the warm sea effect rain depends upon several factors:

1. The temperature contrast between the sea surface and the air passing over it.
2. The over-water distance the air has traversed (the *fetch*).
3. The regional weather situation.
4. Warm sea effect rain is most pronounced and effective wherever terrain features such as small hills or mountains are oriented along the lee shores.

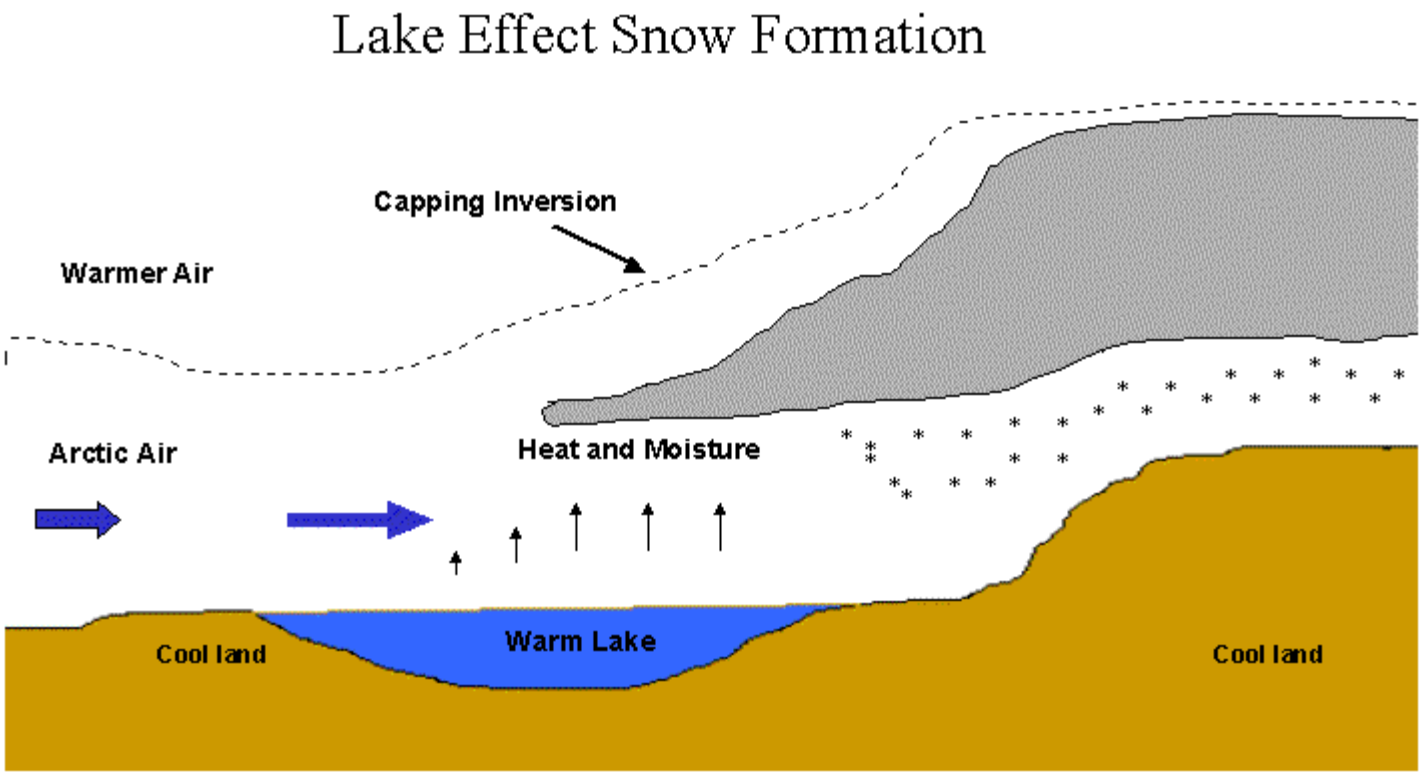
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Warm Sea Effect Rain

- The convective clouds of of warm sea effect showers do not reach the heights attained by thunderstorms, with tops seldom exceeding 12,000 feet in altitude compared to 40,000 to 60,000 feet for thunderstorms.
- This is because cold winter air masses are quite stable, and the warm sea waters are able to destabilize the atmosphere only over a limited depth.

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Lake Effect Snow



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Question?

- What is your favourite Satellite channel ?

- If you were allowed to use only one sattelite channel, which one would you choose?

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Case Study

- On 30th and 31st of December 2005, moderate to heavy rains were observed in Northern Oman.
- Which satellite channel was best to track this case?

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

24 hours amount precipitation. 12/31/2005 at 00:00 UTC

- 1 Khasab Airport (Oman) **31.4 mm**
- 2 Diba (Oman) **2.0 mm**

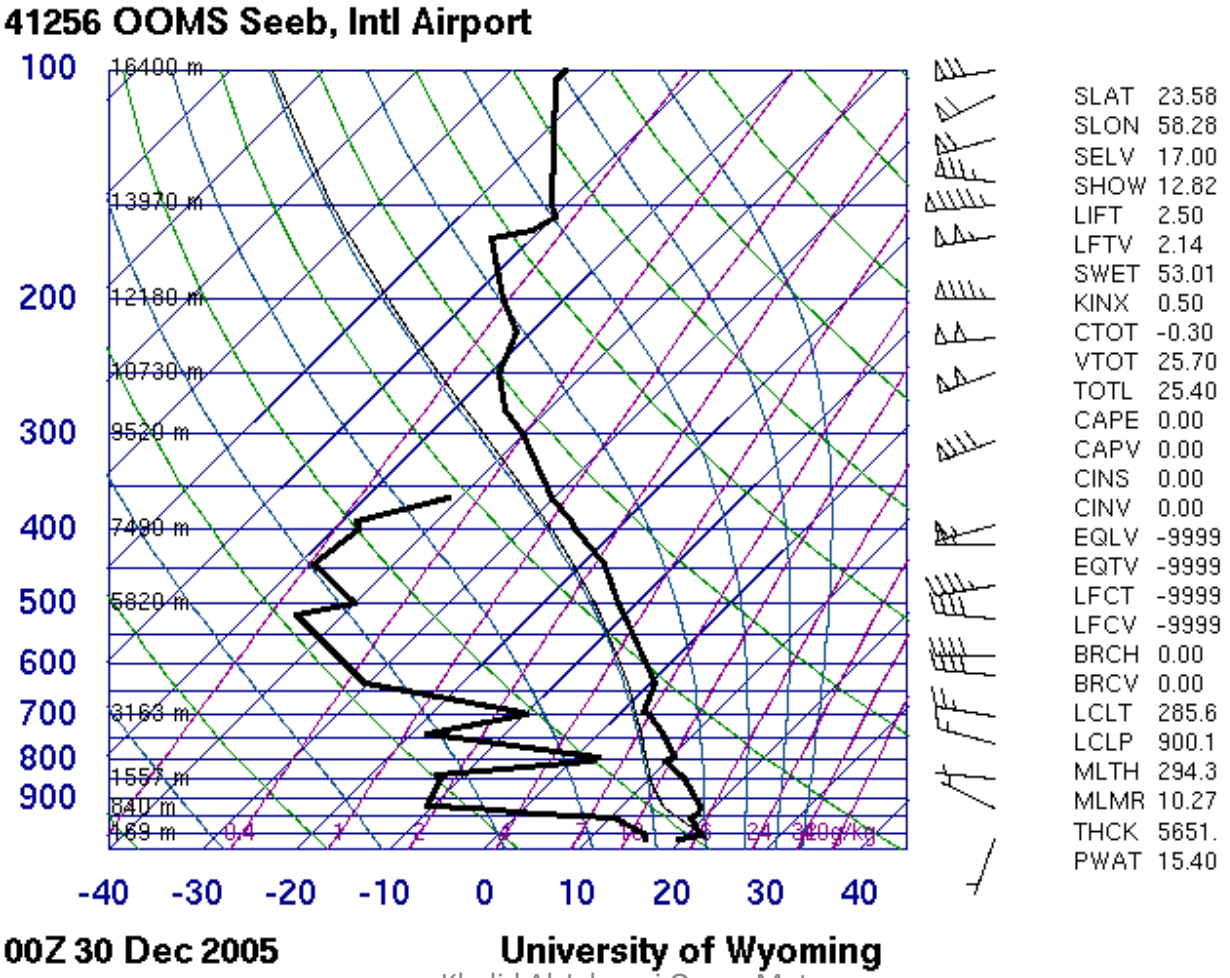
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

24 hours amount precipitation. 01/01/2006 at 00:00 UTC

- 1 Qaboos Port (Oman) **27.8 mm**
- 2 Sohar Majis (Oman) **22.5 mm**
- 3 Rustaq (Oman) **5.6 mm**
- 4 Qalhat (Oman) **4.0 mm**
- 5 Samail (Oman) **2.2 mm**
- 6 Diba (Oman) **0.6 mm**
- 7 Buraimi (Oman) **0.4 mm**
- 8 Seeb, International Airport (Oman) **0.2 mm**
- 9 Sur (Oman) **0.2 mm**

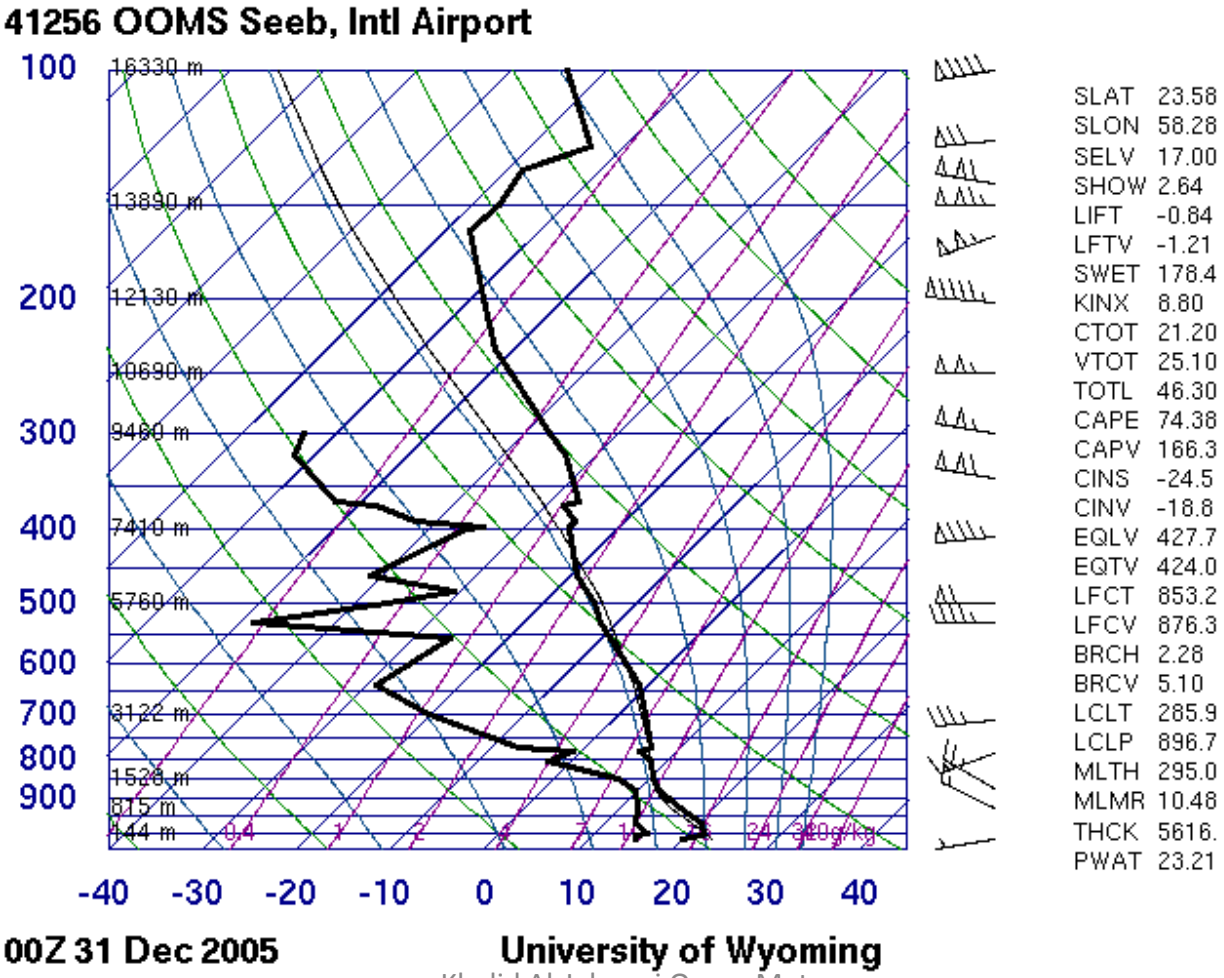
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Seeb Sounding 30 Dec 2005



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Seeb Sounding Dec 31st 2005



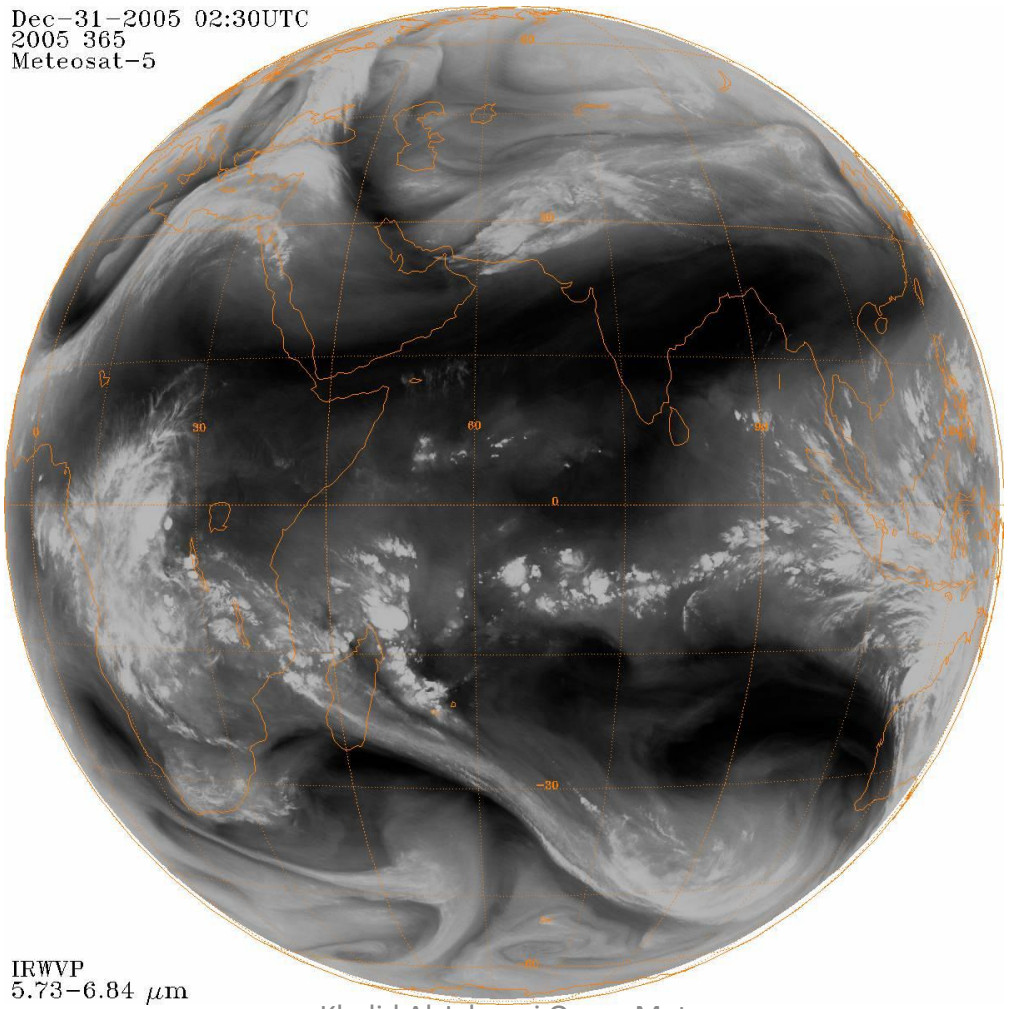
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Question

- Based on the Sounding of Seeb, would you choose WV to track the cloud movement?

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

WV



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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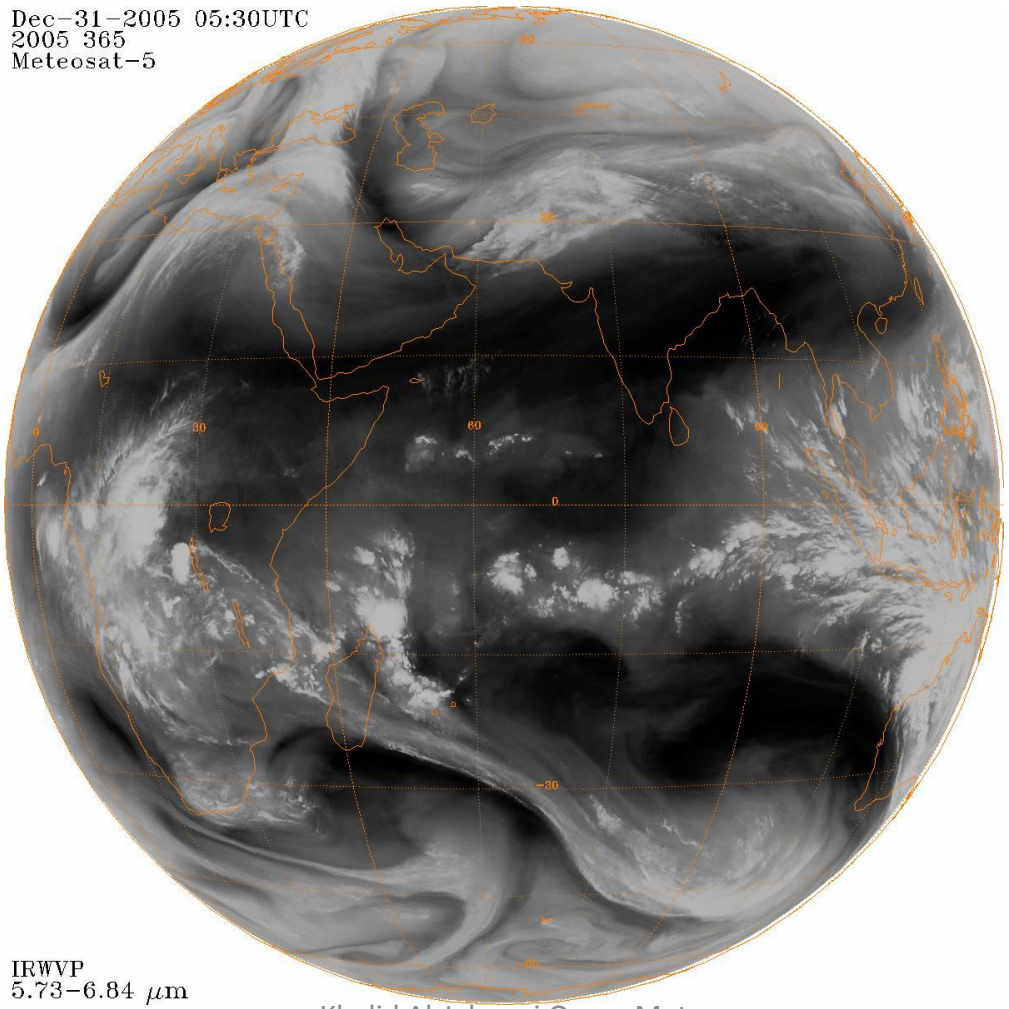

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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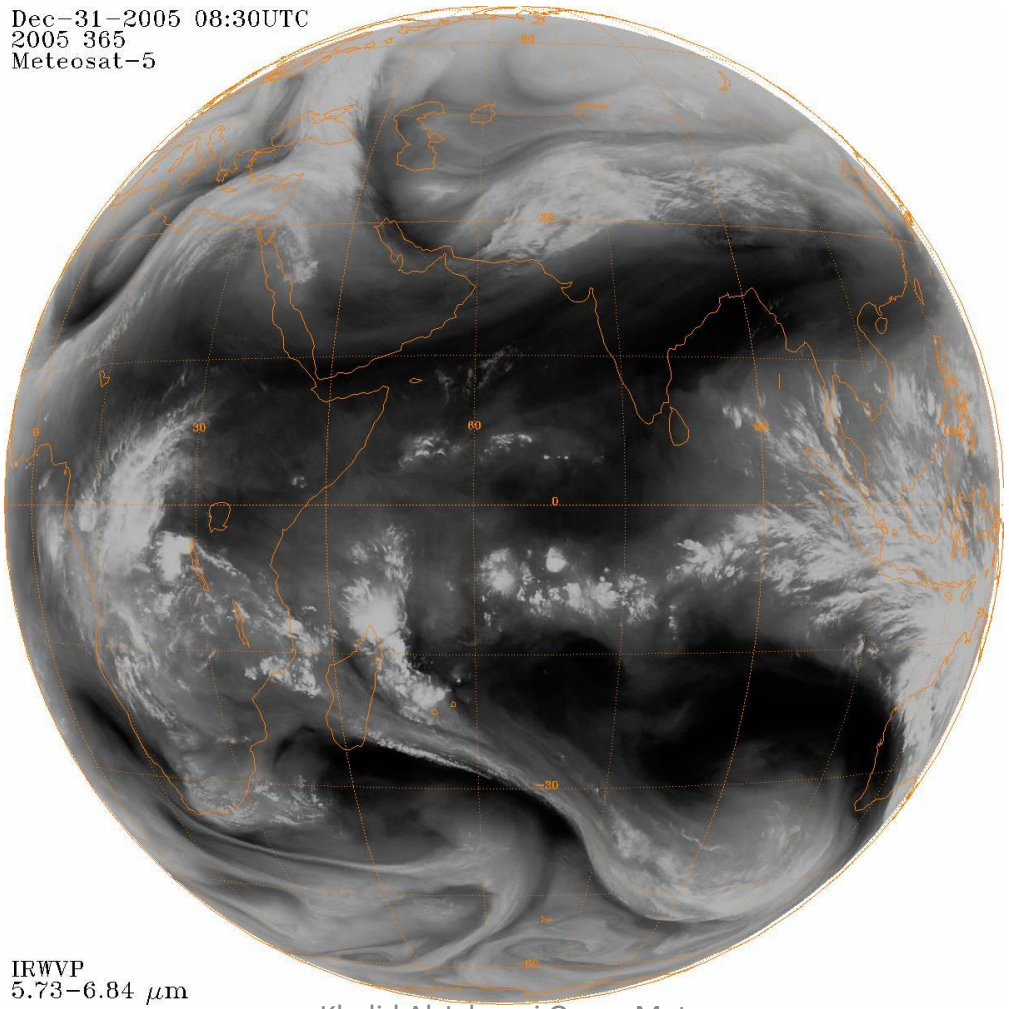

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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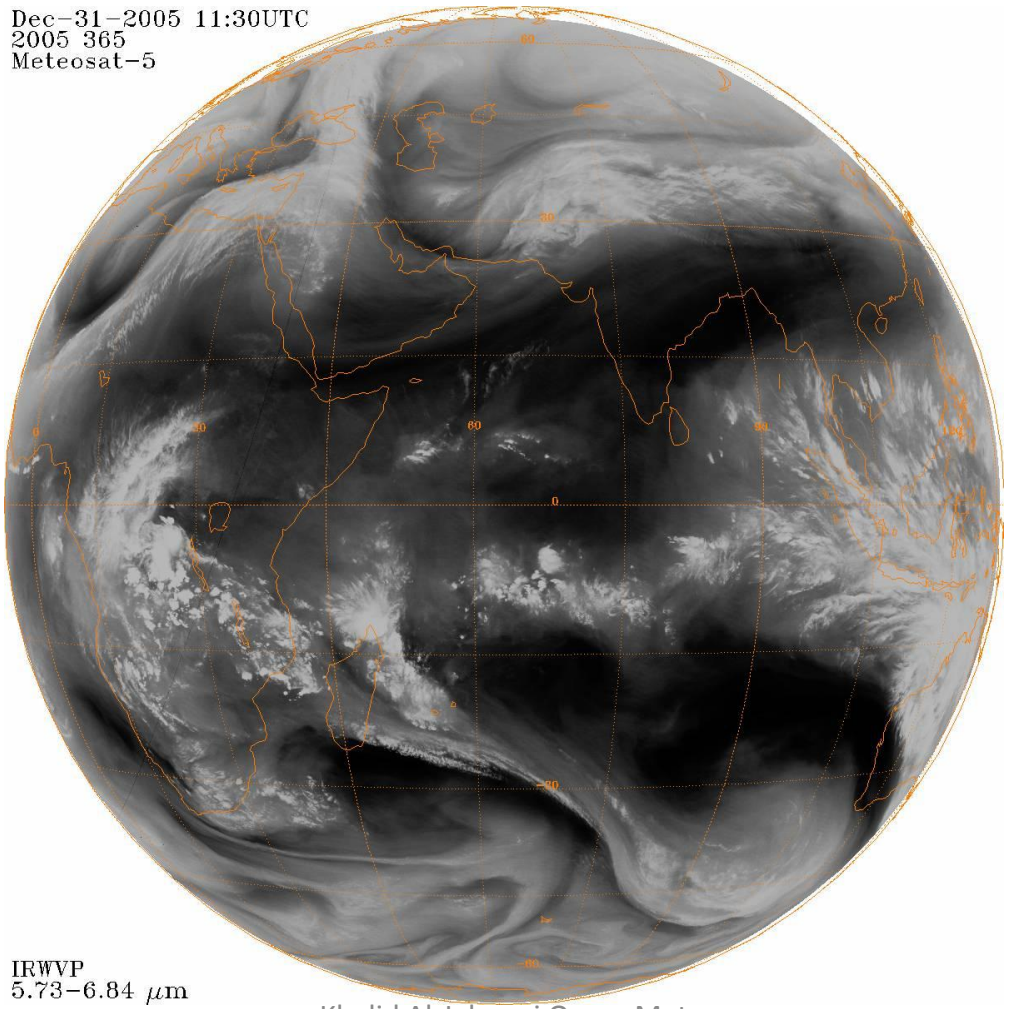

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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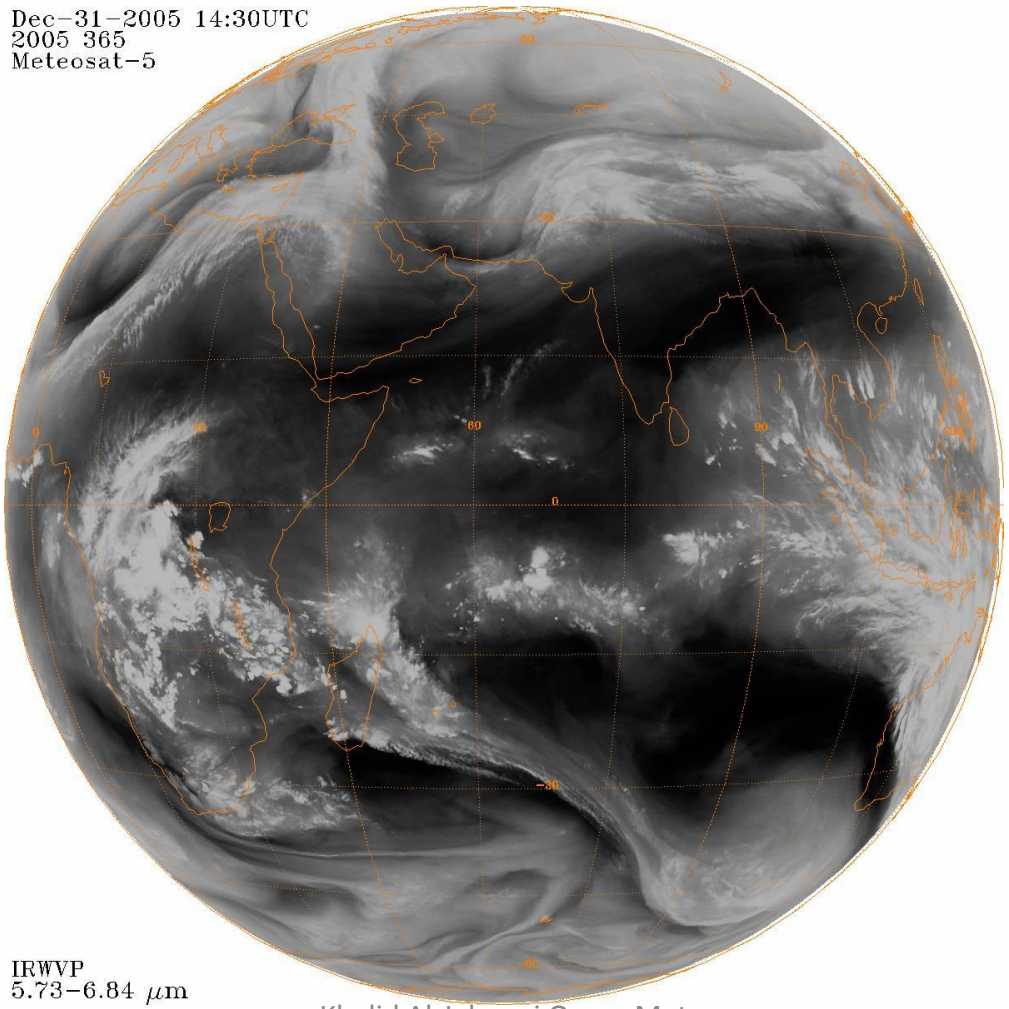

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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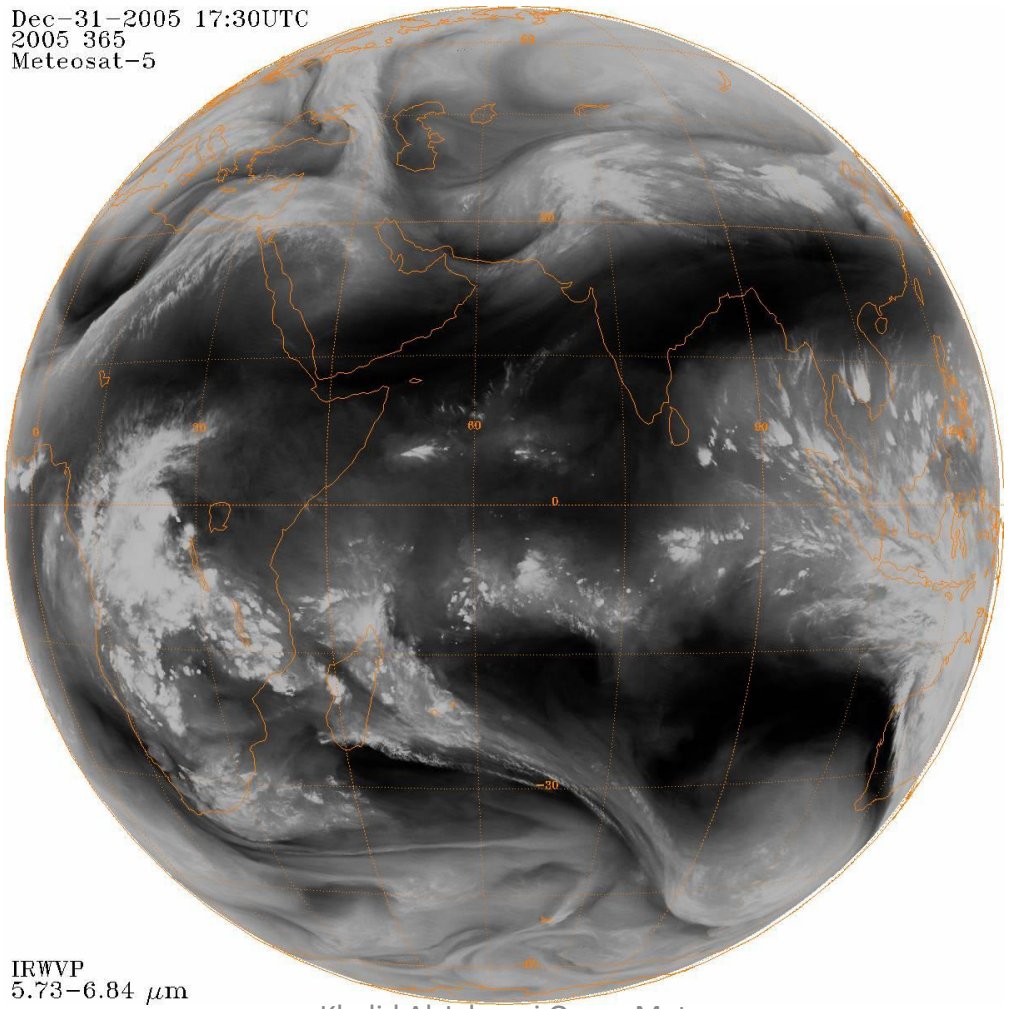

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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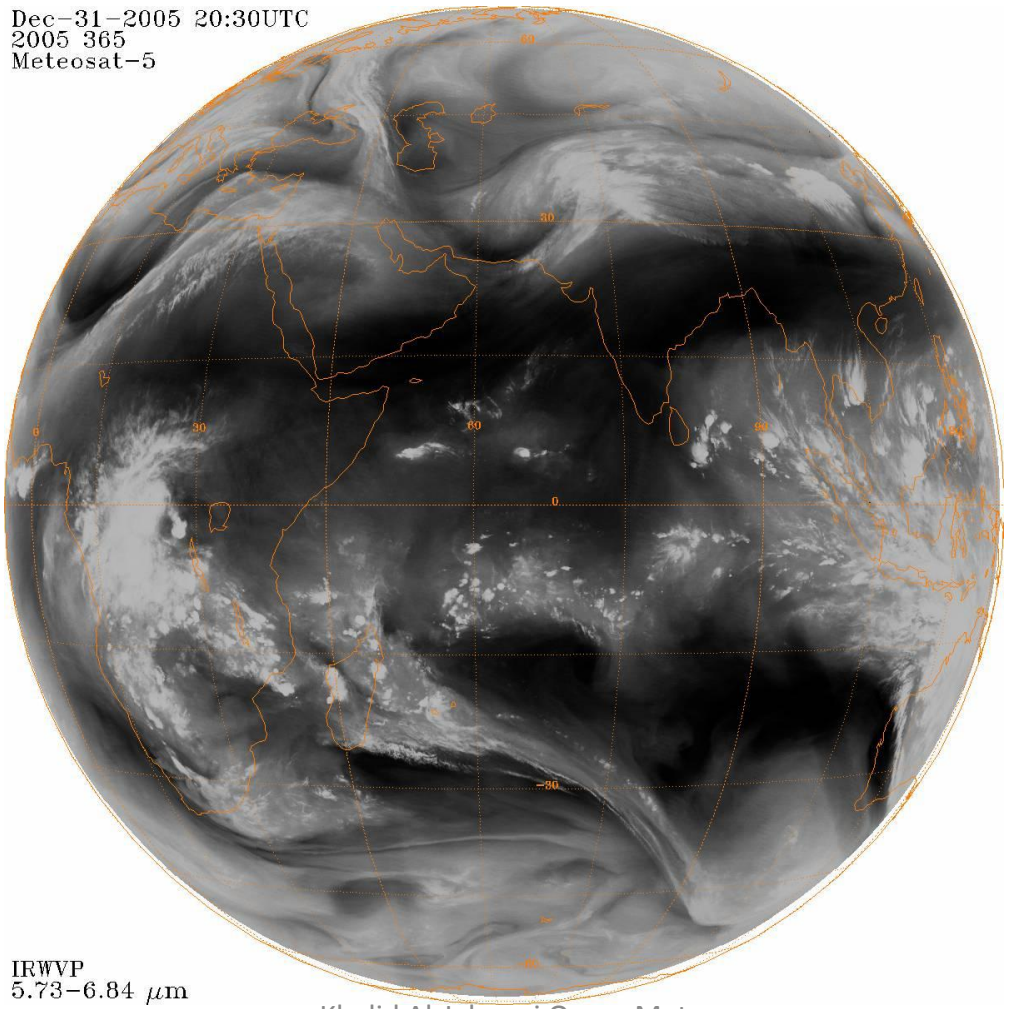
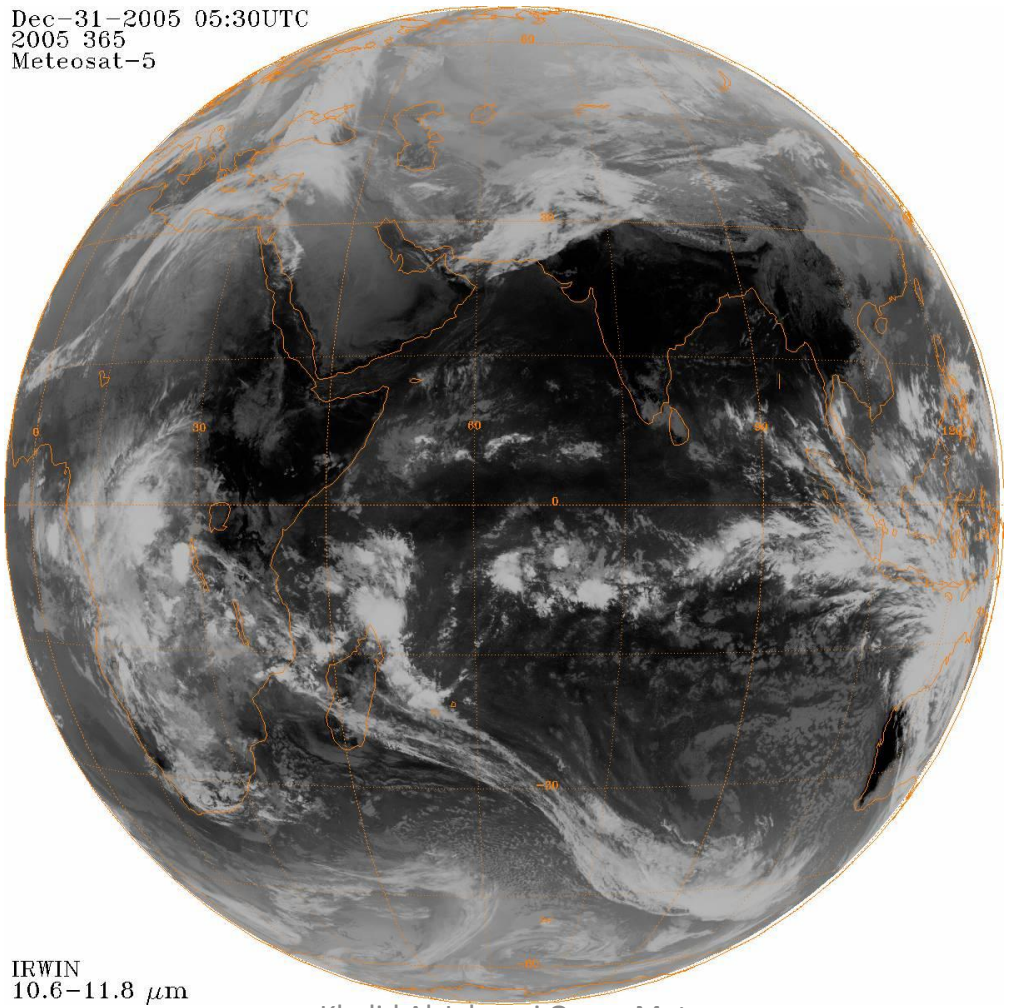


Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

What about IR?

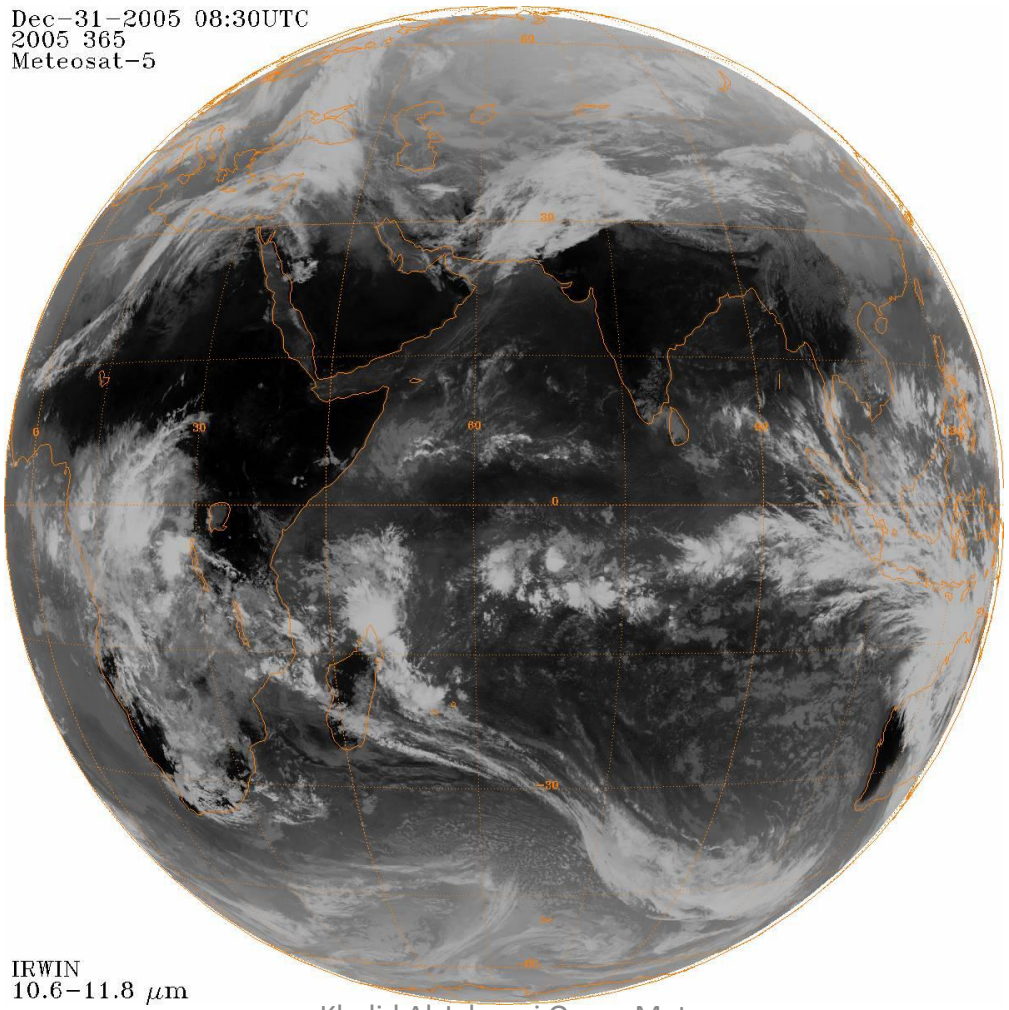
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

IR



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

IR



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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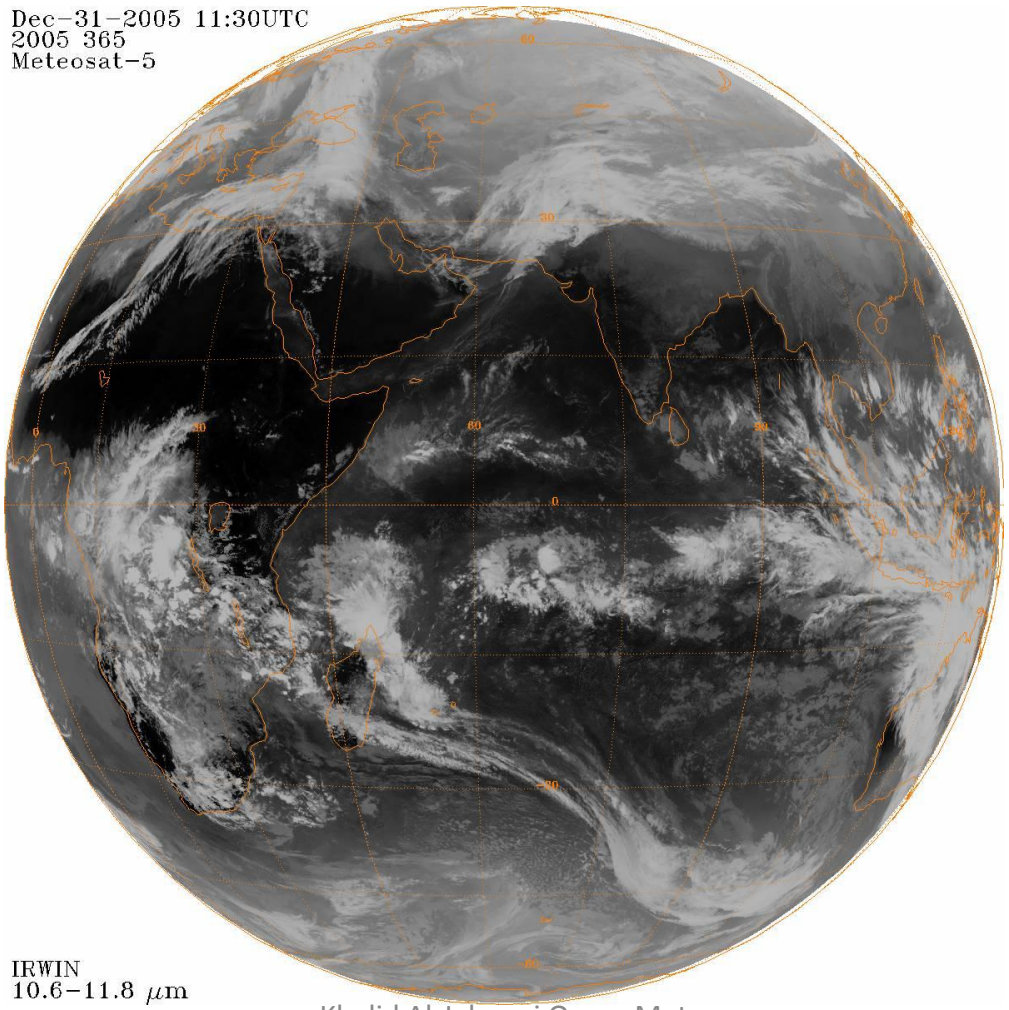

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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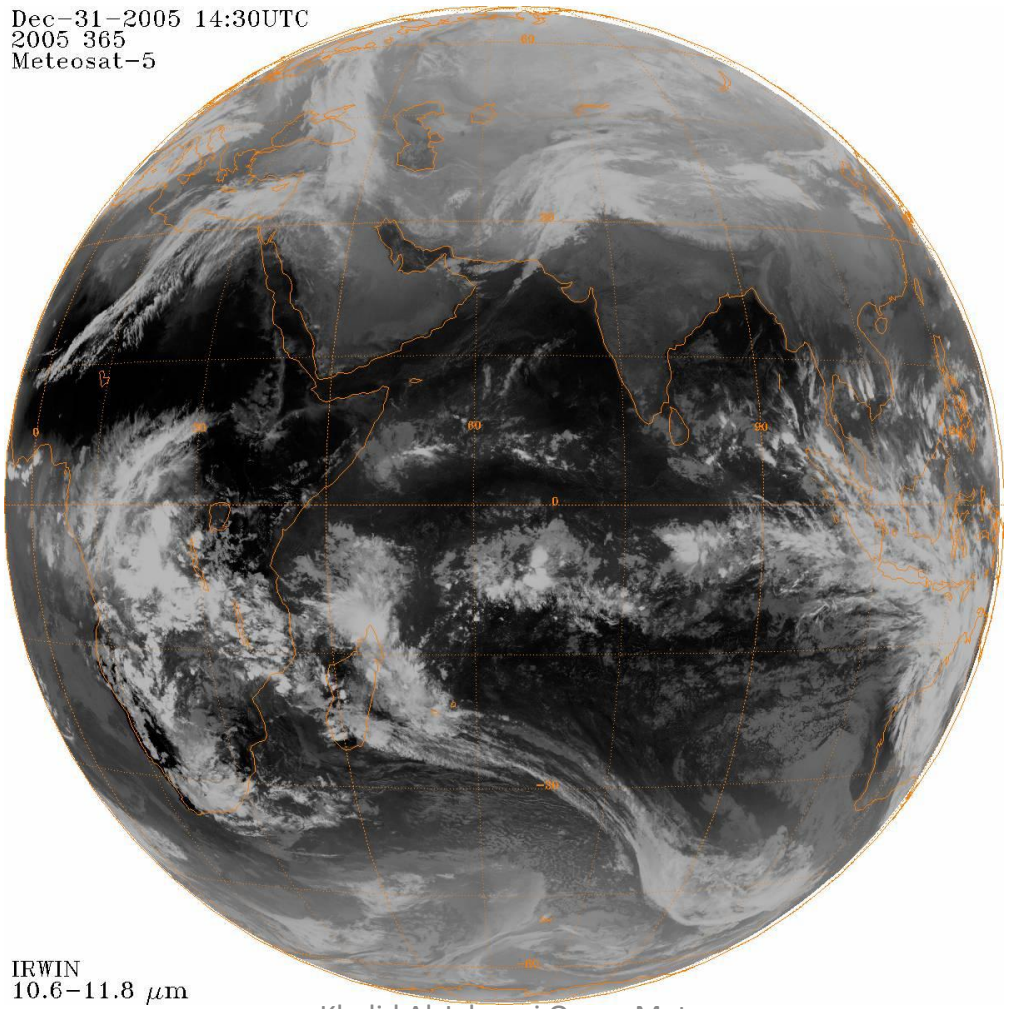

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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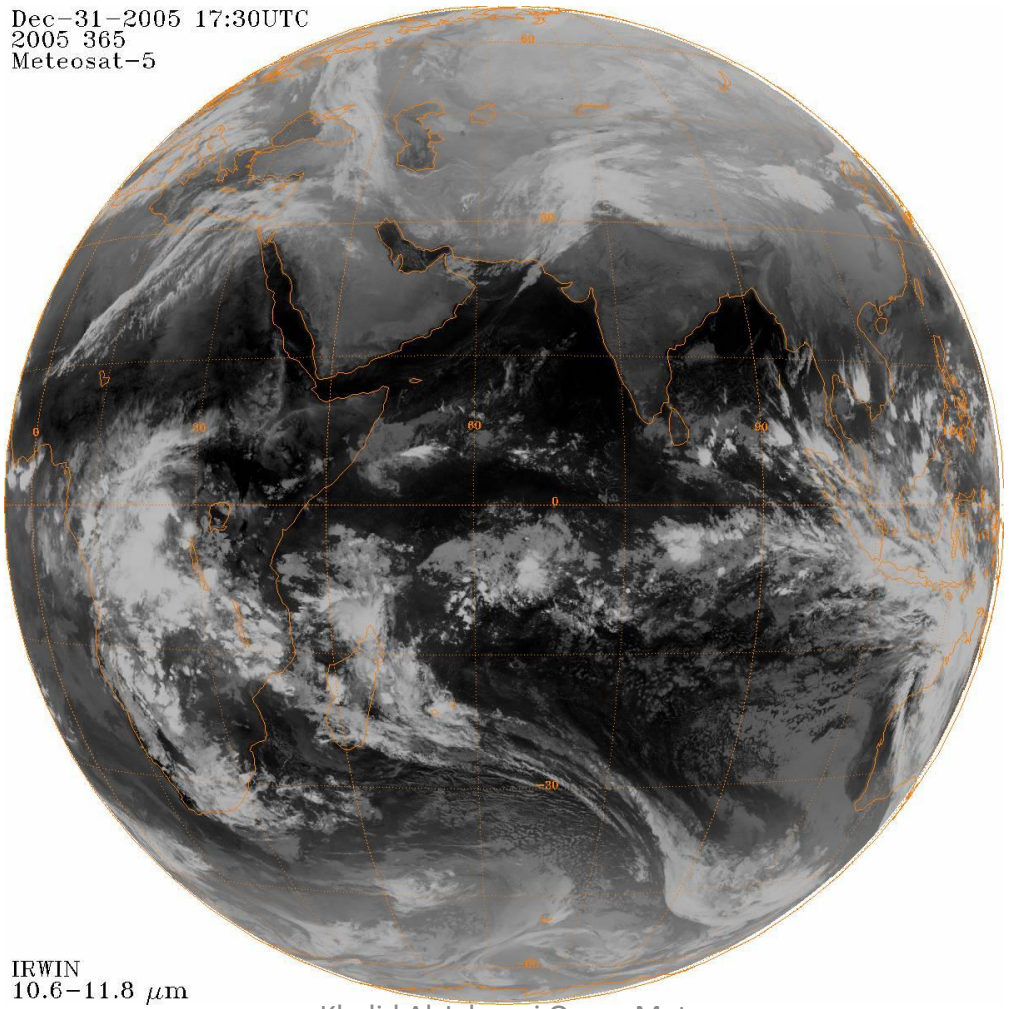

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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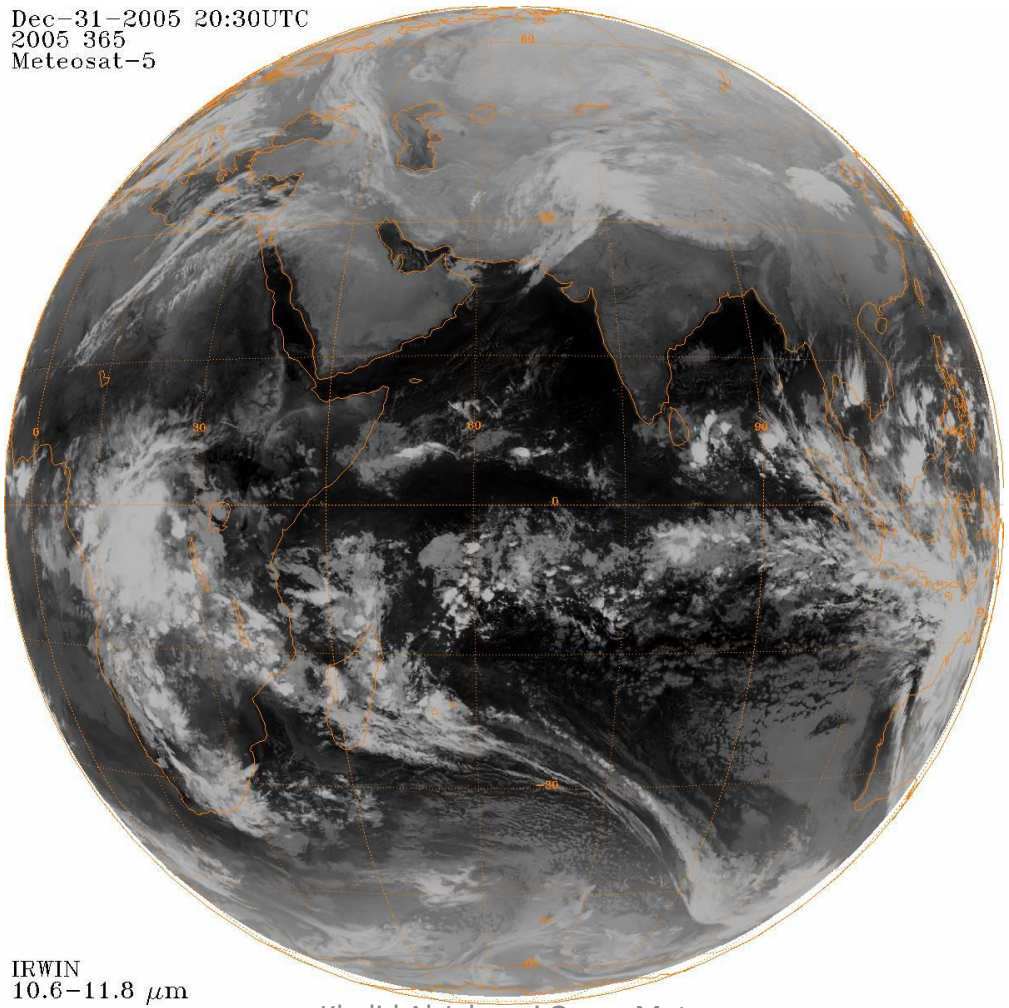
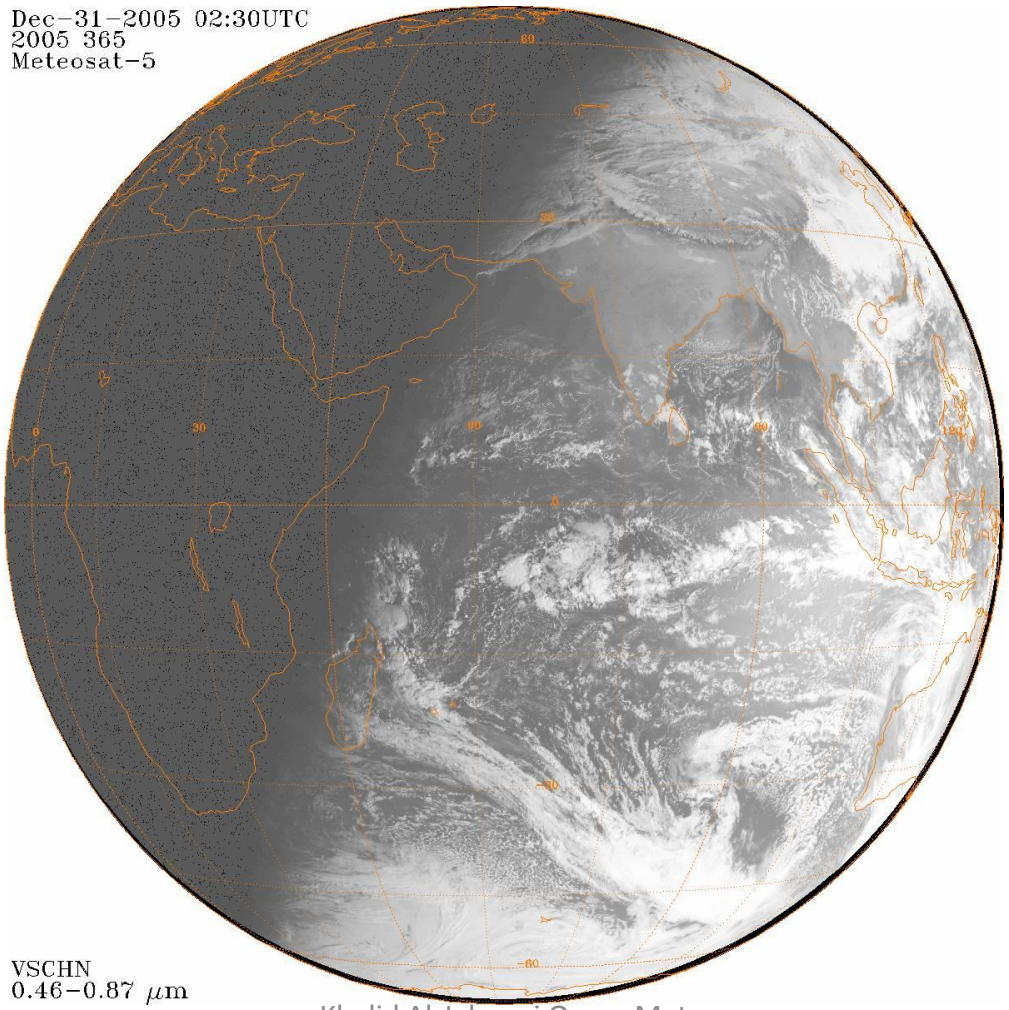


Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

What about VIS

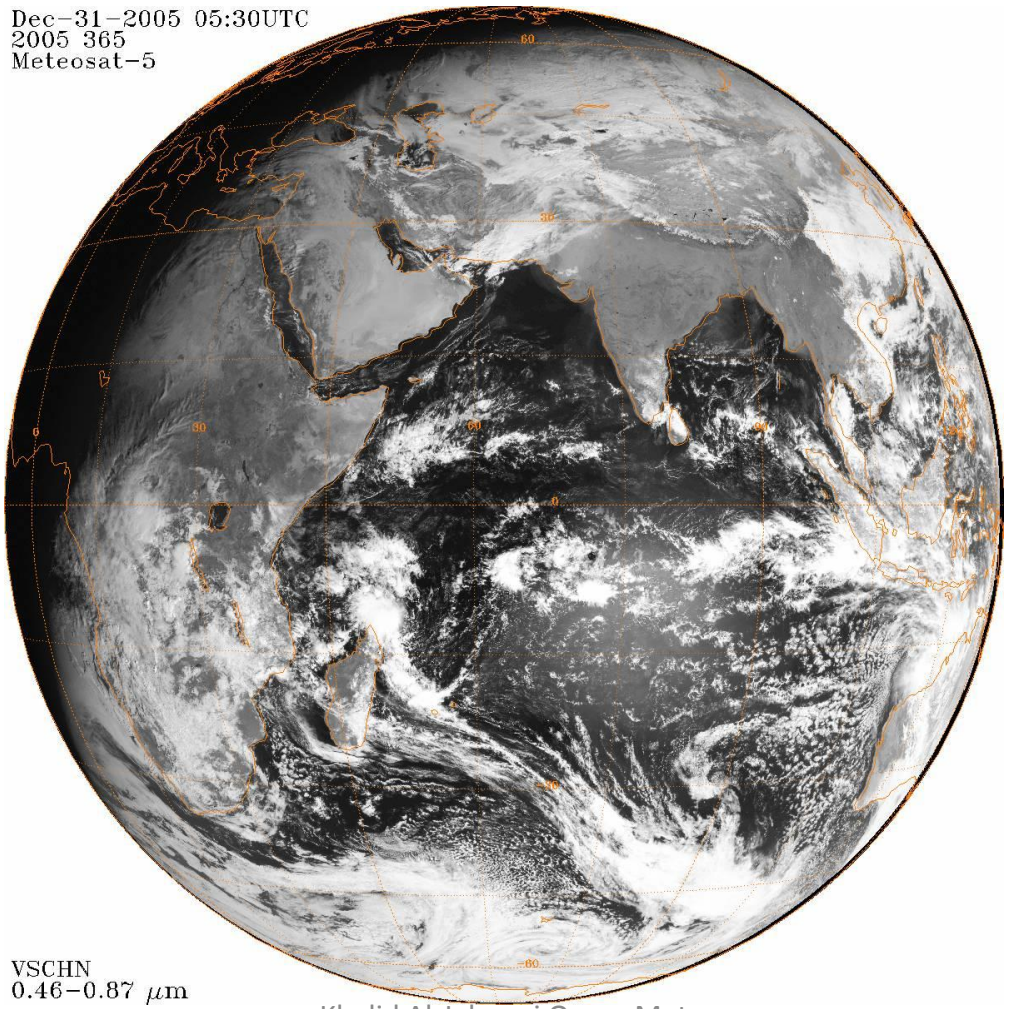
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

vis



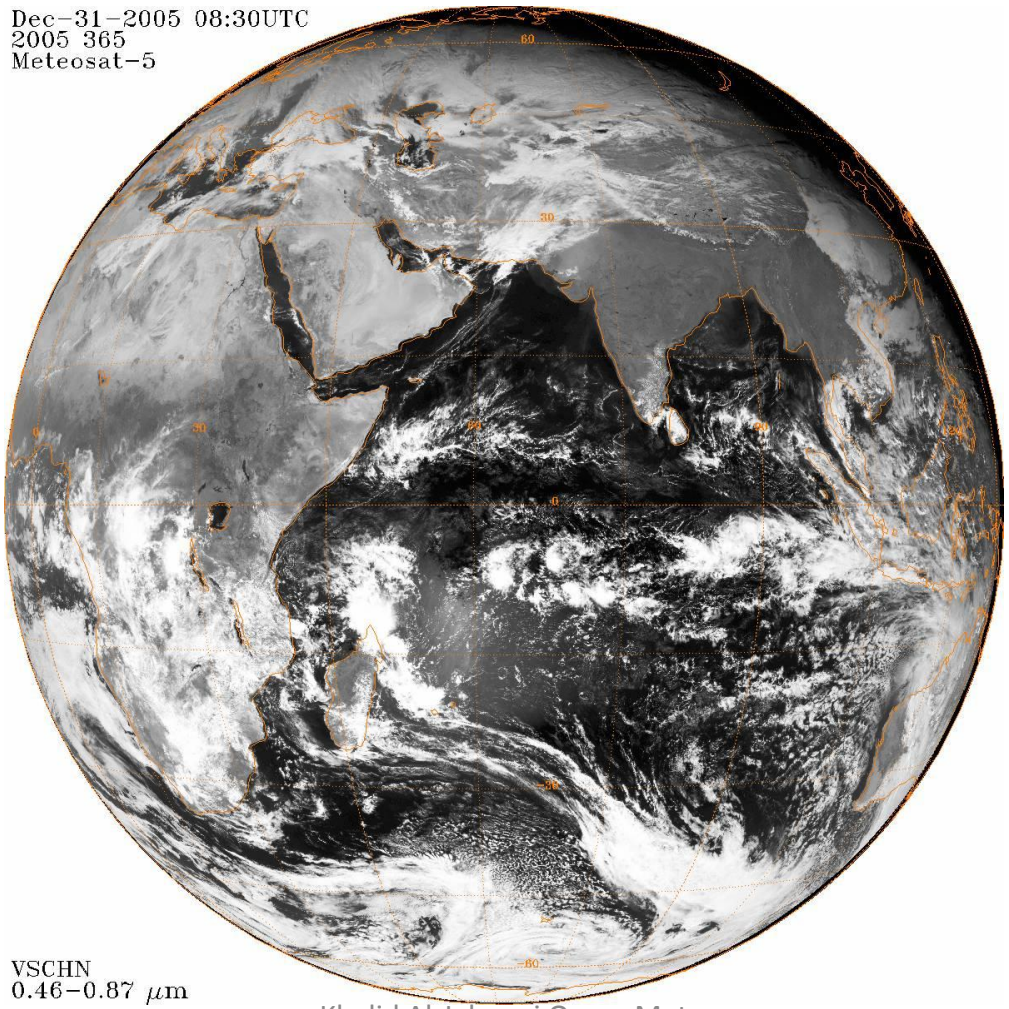
Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

vis



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

vis



Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

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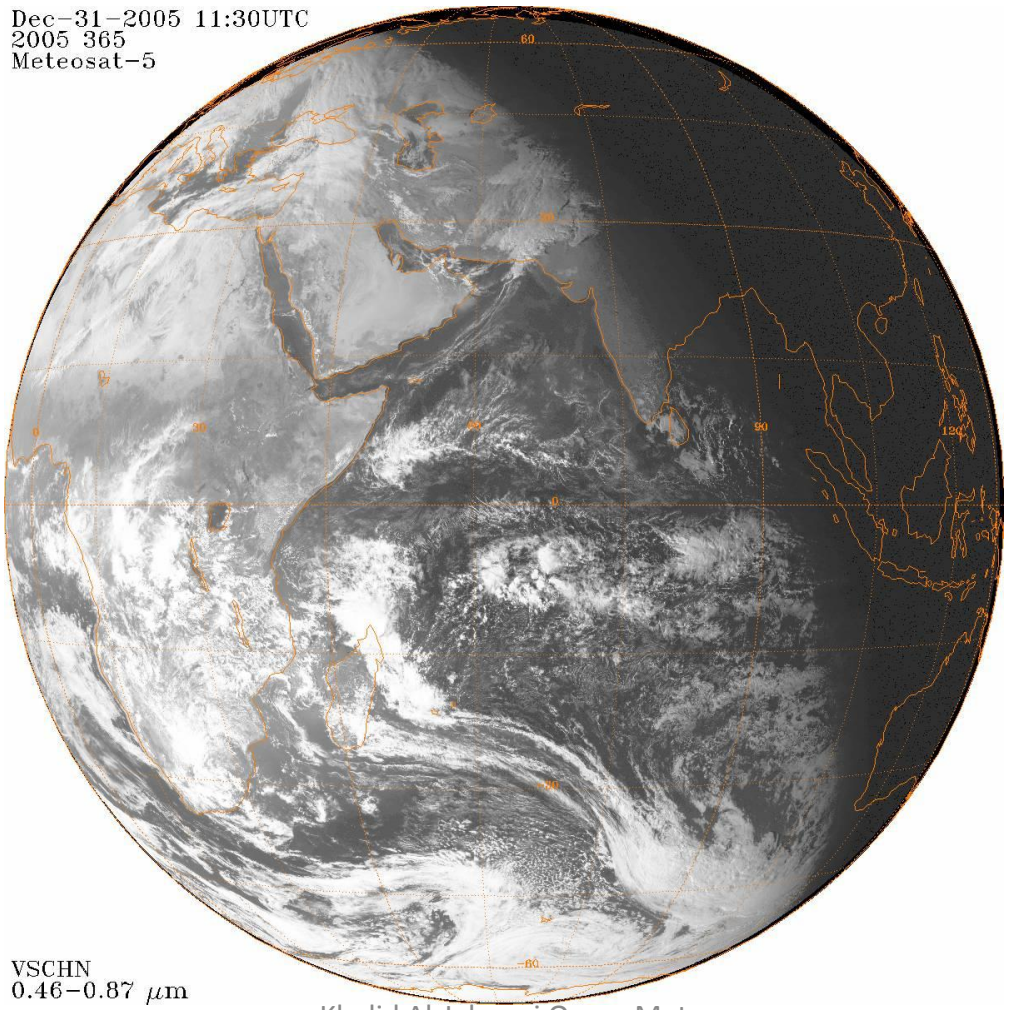

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

WV advantages…

- Since clouds do emit radiation in this waveband, high clouds may be seen.
- In particular thick high clouds, such as (Cb) anvils, stand out prominently in both WV and IR images.
- Broad-scale flow patterns are particularly striking in WV imagery.
- This is because water vapour acts as a passive tracer of atmospheric motions.

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

- The imagery is therefore useful for displaying the mid-tropospheric flow.
- For example, upper tropospheric cyclones are defined clearly by moist spirals or comma-shaped patterns.
- Subsidence areas appear dark.

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

Take Home Message

- It is particularly important to note that even when a WV image indicates a very dry upper troposphere, there may well be moist air near the surface.

- Moist air or cloud in the lower half of the troposphere is not depicted well in WV imagery.

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com

End…….

- Thank you……

Khalid Al-Jahwari Oman Met
khalid_khamis@hotmail.com