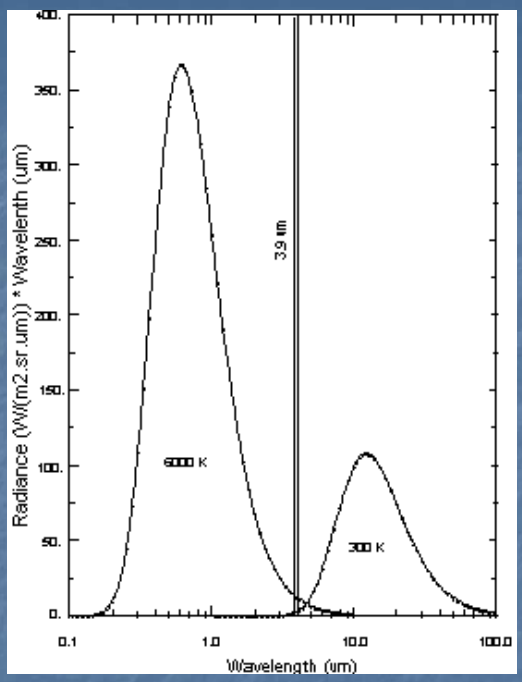
Annex

IR3.9: SOLAR AND THERMAL CONTRIBUTION

(Extraction from the materials of MSG, EUMETSAT)

Annex

SEVIRI CHANNELS: IR3.9 µm



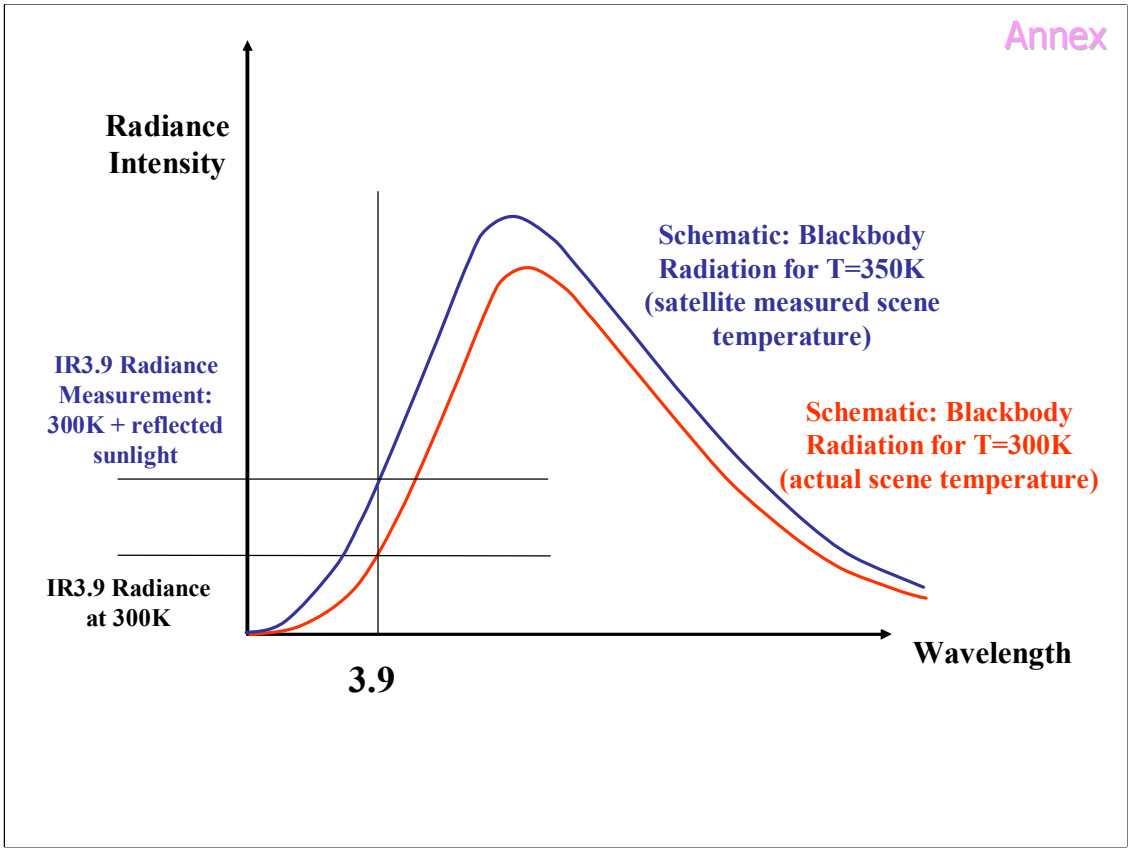
Planck blackbody radiance curves

Signal in IR3.9 channel comes from reflected solar and emitted thermal radiation !

Consequence for Planck relation between radiance and temperature:

during day-time, temperature is not representative of any in situ temperature (see next slide) !

Annex

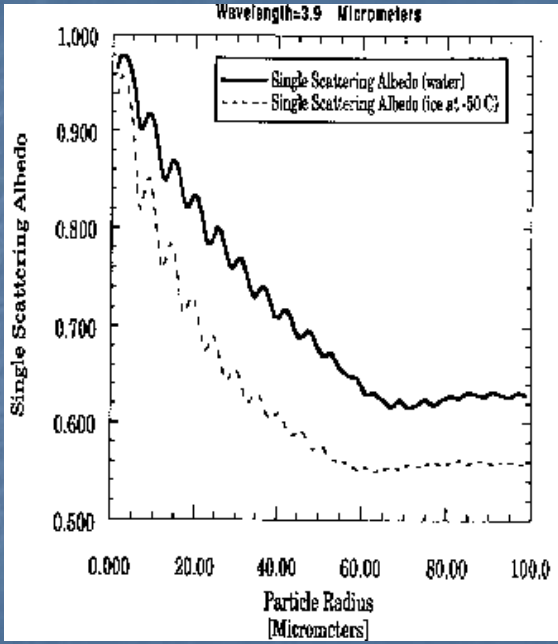

Radiance Intensity
Schematic: Blackbody Radiation for T=350K (satellite measured scene temperature)
IR3.9 Radiance Measurement: 300K + reflected sunlight
Schematic: Blackbody Radiation for T=300K (actual scene temperature)
IR3.9 Radiance at 300K
Wavelength
3.9

Annex

IR3.9: CLOUD PHASE AND PARTICLE SIZE (MAINLY DAY-TIME)

Annex

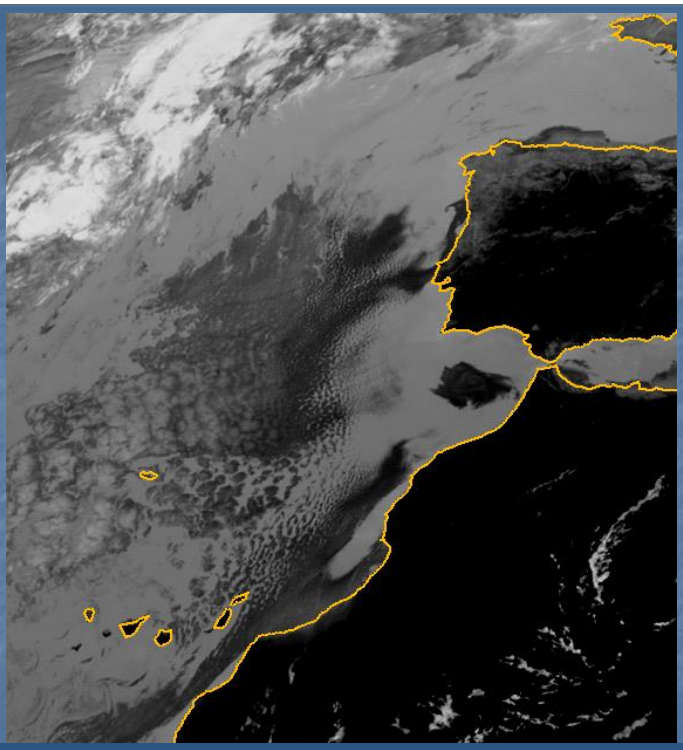
Reflection of Solar Radiation at IR3.9



- Reflection at IR3.9 is sensitive to cloud phase and very sensitive to particle size
- Higher reflection from water droplets than from ice particles
- During daytime, clouds with small water droplets (St, Sc) are much darker than ice clouds
- Marine Sc (large water droplets) is brighter than Sc over land

Annex

IR3.9: Cloud Phase

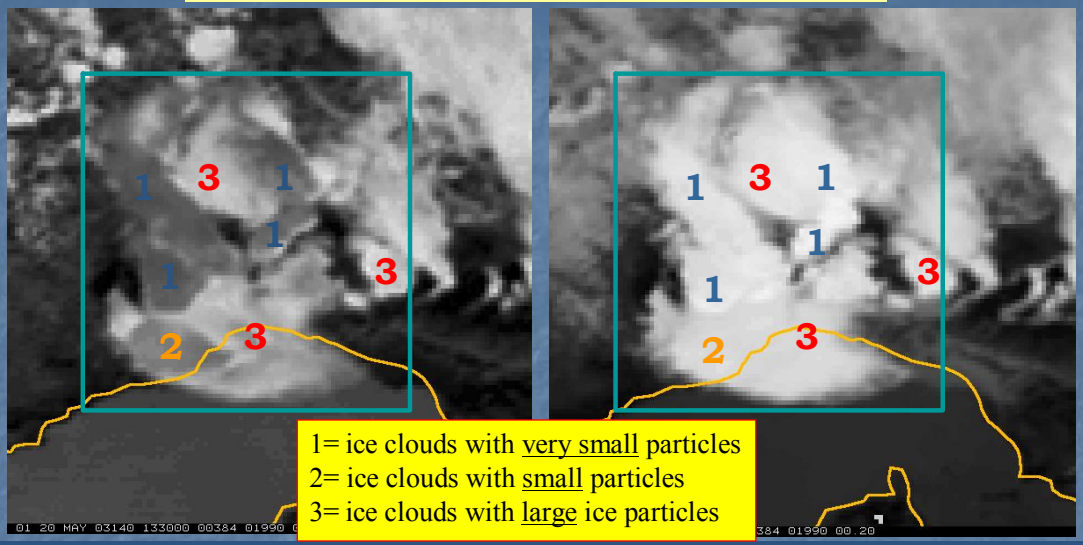


MSG-1, 07 July 2003, 11:00 UTC, Channel 04

Due to the high reflection from water droplets at IR3.9, low-level water clouds are much darker than high-level ice clouds (during day-time)

Annex

IR3.9 shows much more cloud top structures than IR10.8 (very sensitive to particle size)



1= ice clouds with very small particles
2= ice clouds with small particles
3= ice clouds with large ice particles

Channel 04 (IR3.9) Channel 09 (IR10.8)

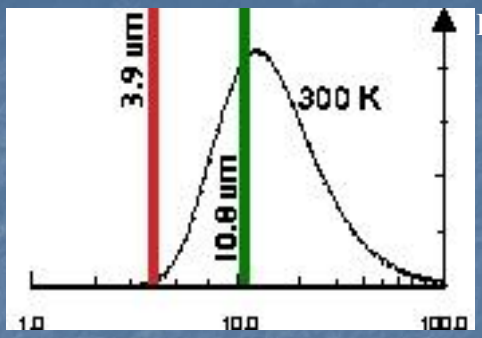
MSG-1, 20 May 2003, 13:30 UTC

Annex

NOISE IN THE IR3.9 CHANNEL

Annex

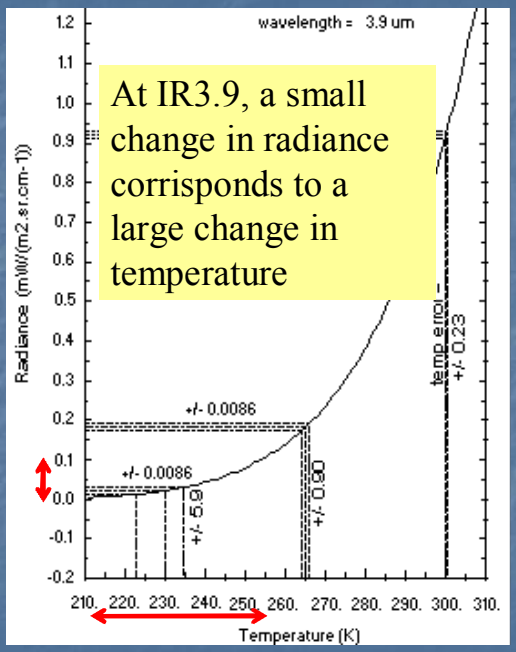
Noise in the IR3.9 Channel



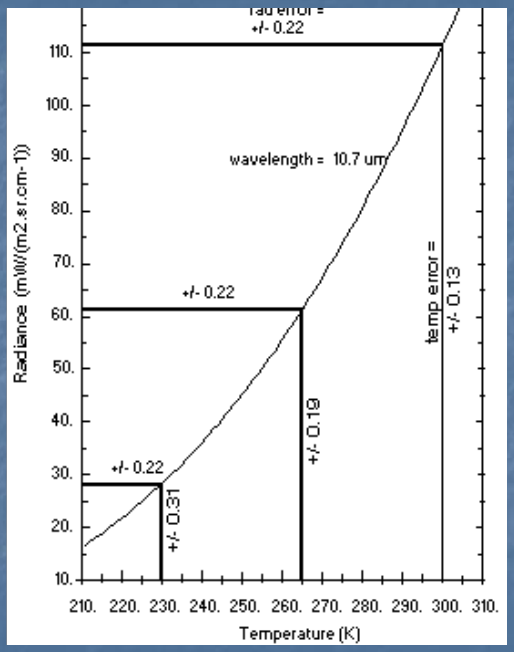
- At IR10.8, equivalent brightness temperatures can be determined very accurately at both warm and cold scene temperatues
- At IR3.9, the radiance increases rapidly with increasing temperature (see next slide)
- Since measurement accuracy is constant, the result is a much less accurate temperature measurement at cold scene temperatures in the IR3.9 channel

Annex

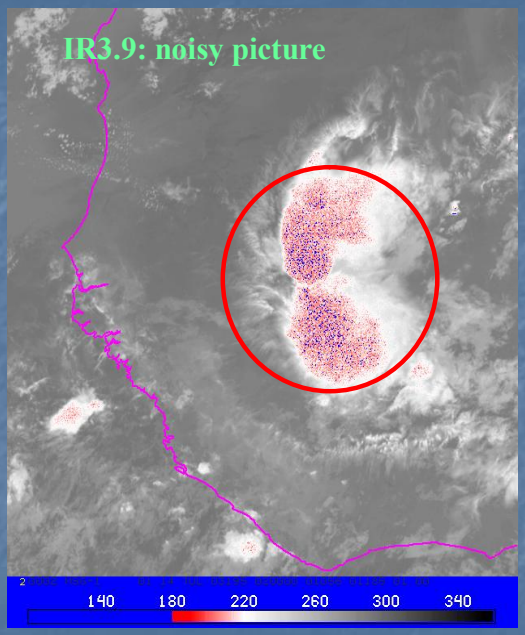
Noise in the IR3.9 Channel



At IR3.9, a small change in radiance corrisponds to a large change in temperature



Noise in the IR3.9 Channel: Example



MSG-1, 14 July 2003, 02:00 UTC, IR3.9

During the night, the IR3.9 channel cannot be used for cold cloud tops.

Below BTs of 220 K the IR3.9 channel is very noisy (radiances close to zero).

RAW [count]	RAD [mW/m^2]	TEMP [K]
54	0.01	218
53	0.01	213
52	0.00	205
51	0.00	131

Interpretation: IR3.9 imagery does a fine job for warm scene temperatures, but at night it is not useful for cold scenes like thunderstorm tops.

Back to main slide

Annex