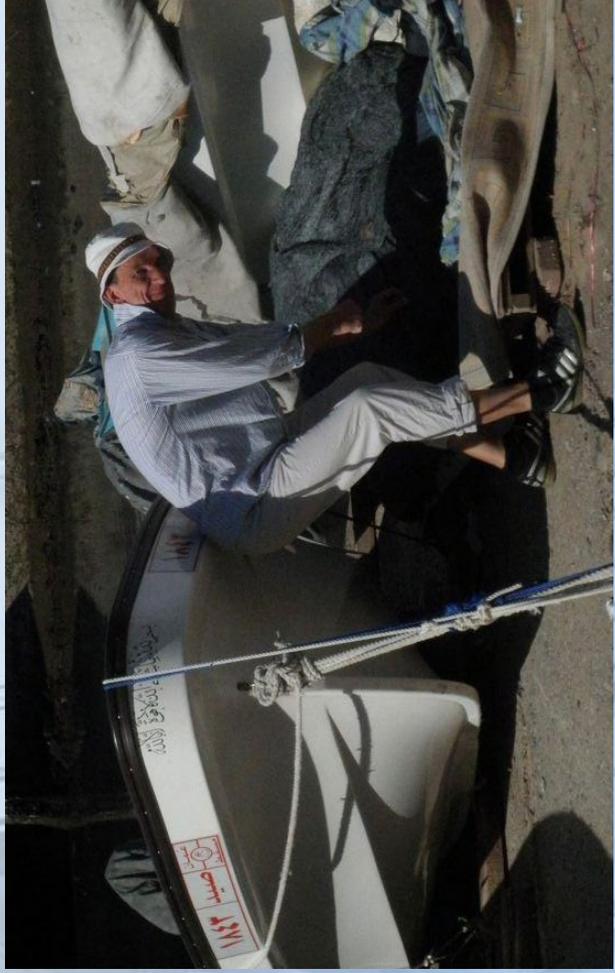




Meteosat solar channels



jose.prieto@eumetsat.int



Quiz 1

2

A. How many channels in the human visible domain does include the SEVIRI instrument in Meteosat?

- 4 or more
- 3
- 2
- 1

B. How many SEVIRI channels collect solar radiation reflected by the Earth?

- 5 or more
- 4
- 3
- 2

C. How many solar channels do you use routinely at work?

- 4 or more
- 3
- 2
- 1
- 0

Quiz

3



Same date-time? Is this June image SOLAR or THERMAL-infrared?

YES

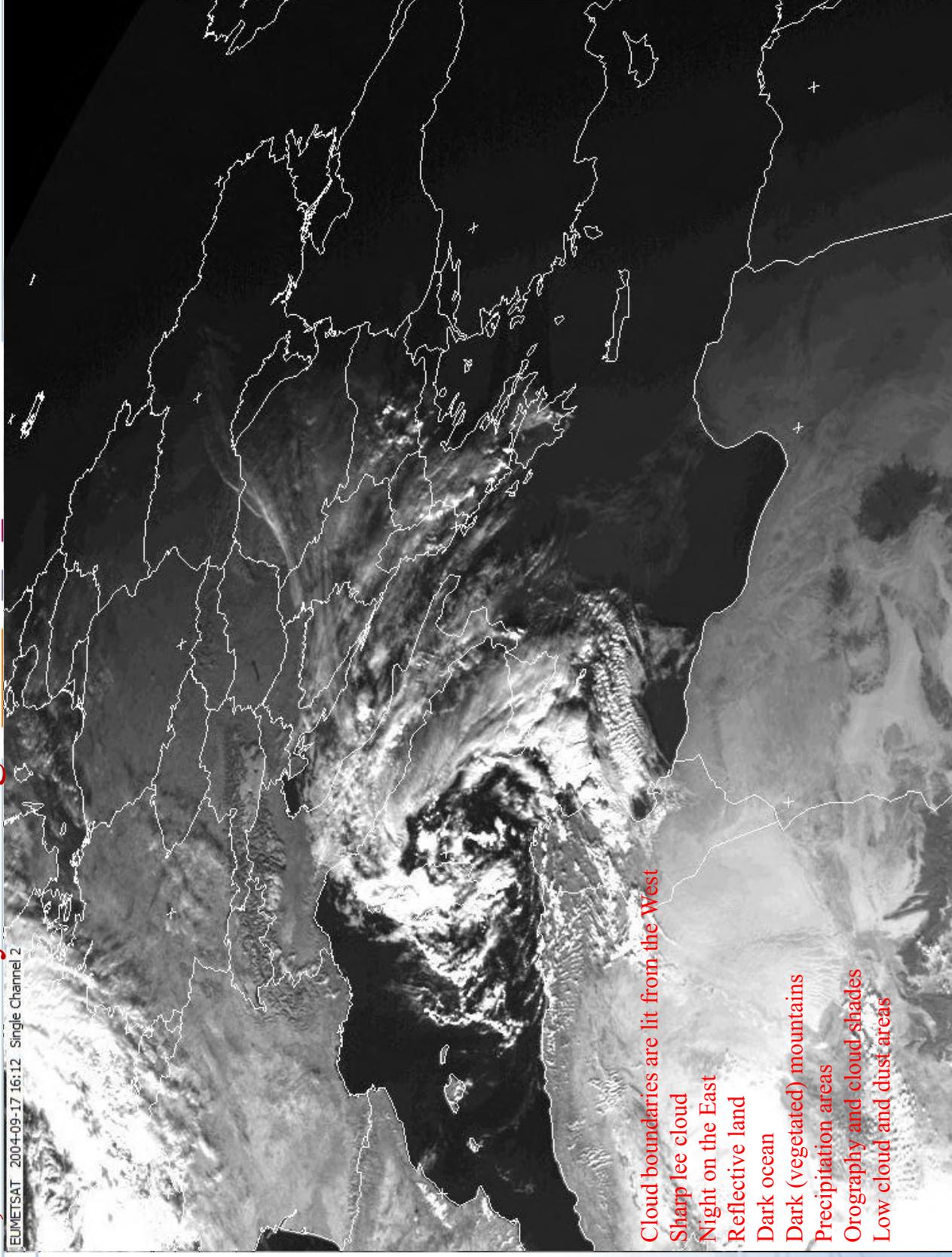
NO



Is this solar? YES NO

If not, what would you change to “solarise” it?

EUMETSAT 2004-09-17 16:12 Single Channel 2



Cloud boundaries are lit from the West

Sharp lee cloud

Night on the East

Reflective land

Dark ocean

Dark (vegetated) mountains

Precipitation areas

Orography and cloud shades

Low cloud and dust areas

SEVIRI CHANNELS

Properties			
Channel	Cloud	Gases	
HRV 0.7		Application	
VIS 0.6		Broad band VIS	Surface, aerosol, cloud detail (1 km)
VIS 0.8		Narrow band	Ice or snow
NIR 1.6		Narrow band	Vegetation
IR 3.8		Window	Aerosols, snow <> cloud
WV 6.2		Triple window	SST, fog <> surface, ice cloud
WV 7.3		Water vapour	Upper troposphere 300 Hpa humidity
IR 8.7		Water vapour	Mid -troposphere 600 Hpa humidity
IR 9.7		Almost window	Water vapour in boundary layer, ice <> liquid
IR 10.8		Ozone	Stratospheric winds
IR 12.0		Split window	CTH, cloud analysis, PW
IR 13.4		Split window	Land and SST
	Carbon dioxide	+10.8: Semitransparent-cloud top , air mass analysis	

5

12

1

2

3

4

5

6

7

8

9

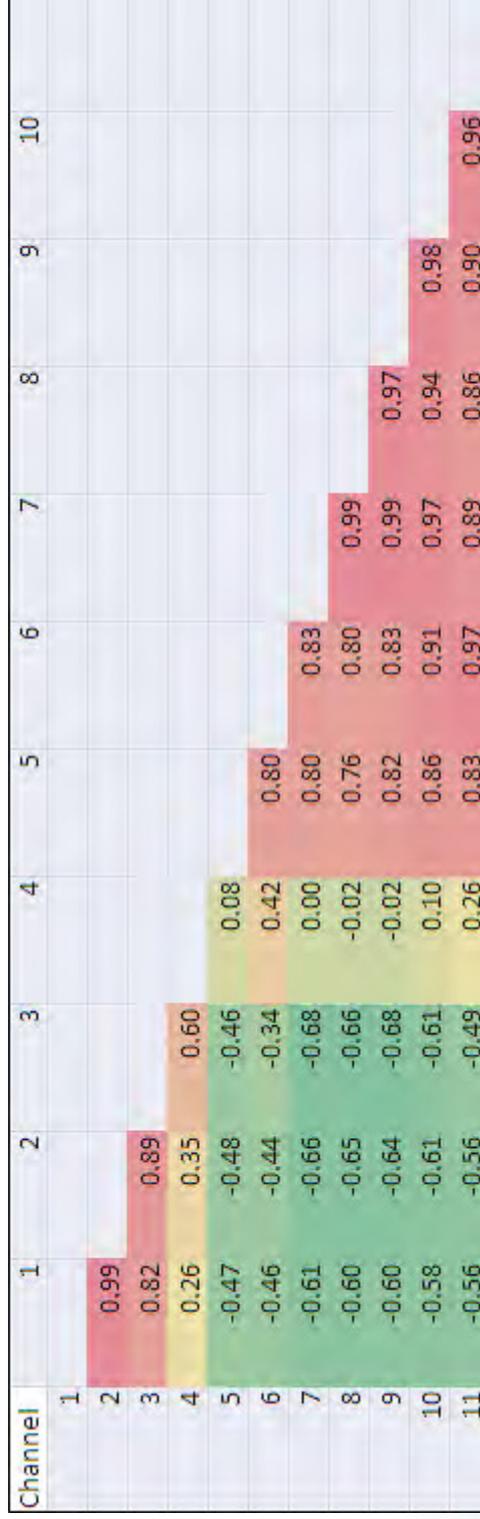
10

11



SEVIRI channel similarity

← solar → ←3.9→ ← thermal →



- Solar channels 0.6 and 0.8 μm are very similar
- Those two channels are dissimilar of 1.6 μm
- All three have a NEGATIVE radiance correlation with the thermal. Why? GROUND? OCEAN? CLOUD?

Line talk



START HERE:

1 I do not like coming back home

3 My wife...

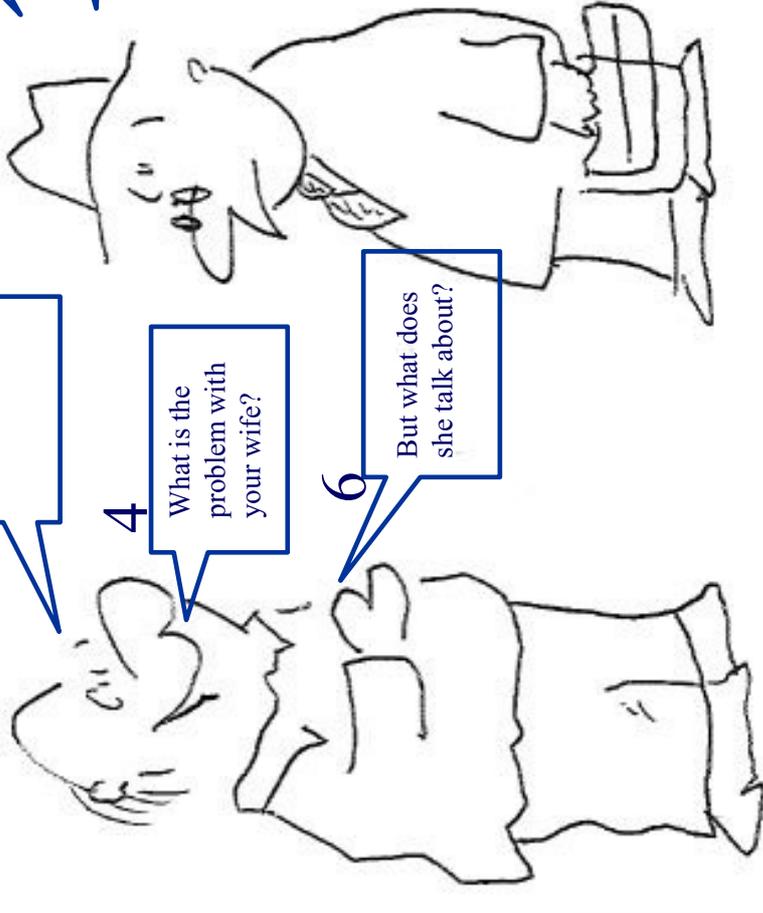
5 She talks and talks and talks..

7 She does not tell me!

2 Why is that?

4 What is the problem with your wife?

6 But what does she talk about?



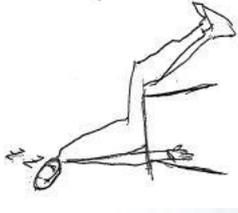
Contents



➤ Where is LIGHT absorbed ?



➤ Is the neighbour's GRASS greener?

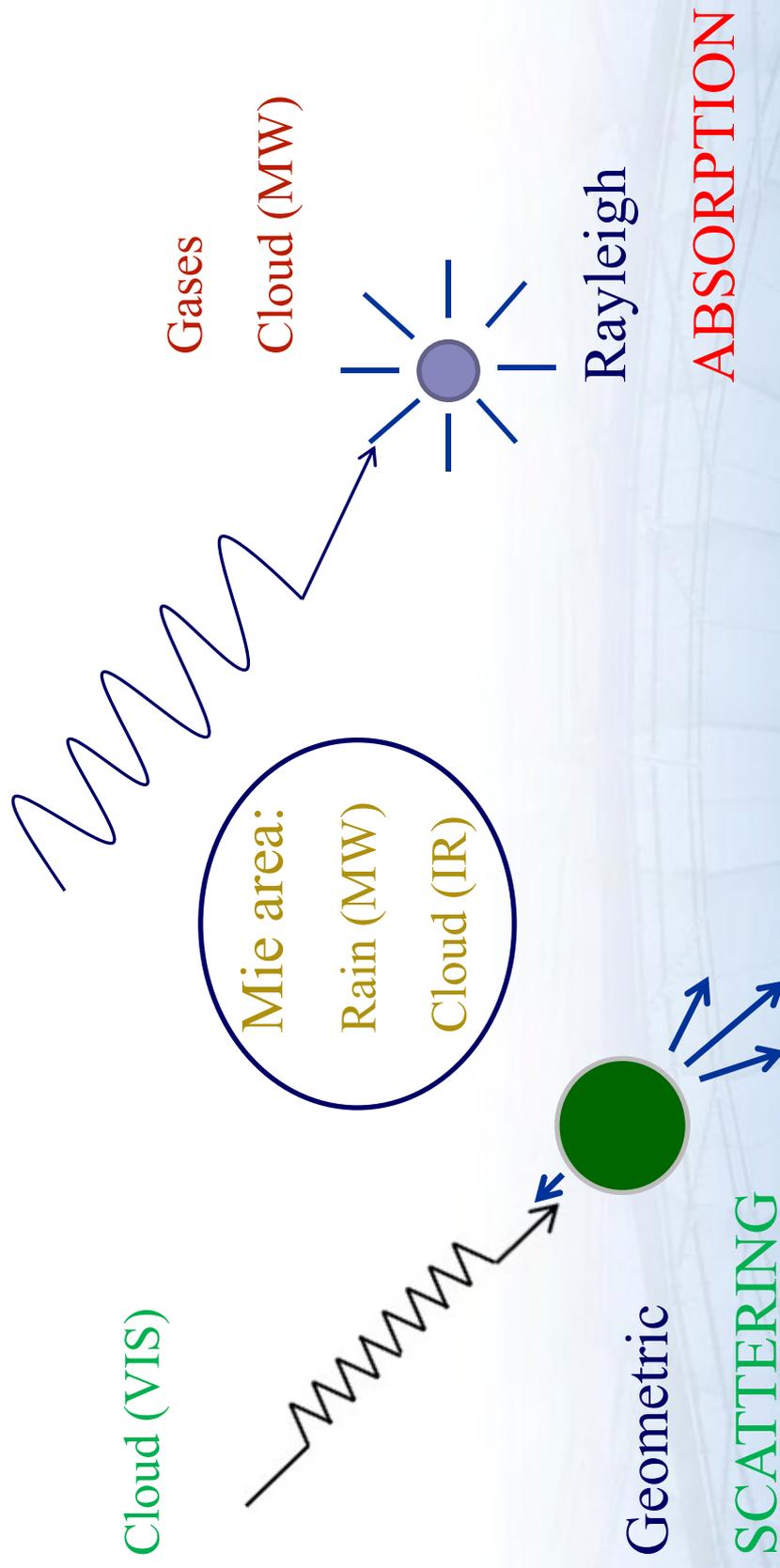


➤ Is ICE always cyan?

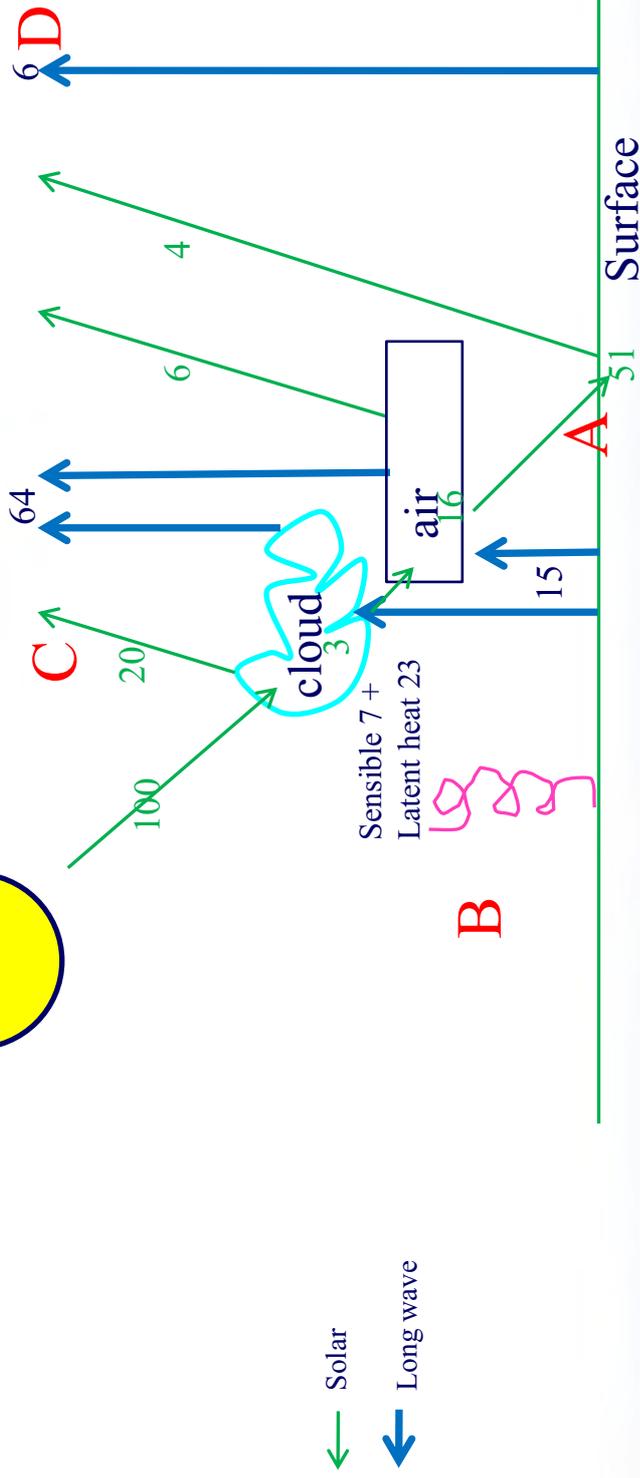


➤ Is DUST enhancing visibility?

RADIATION and MATTER



Balance at top and surface, greenhouse atmosphere



- A) **Ocean surface is the main absorber of solar radiation, but cold**
- B) The atmosphere gets **more** energy from sun and surface **radiation (34) than from convection (30)**
- C) Most solar radiation to space comes from **cloud (20/30)**. **Air** contributes more solar radiation to the satellite (6/30) than the **surface (4/30)**. Use solar window channels to see the surface!
- D) **Only 6/70** of Earth heat at the satellite comes **from the surface**. Focus on IR window channels!

Earth Surface

Channel 01 (VIS0.6)

Clouds

High reflectance 11

Sun Glint

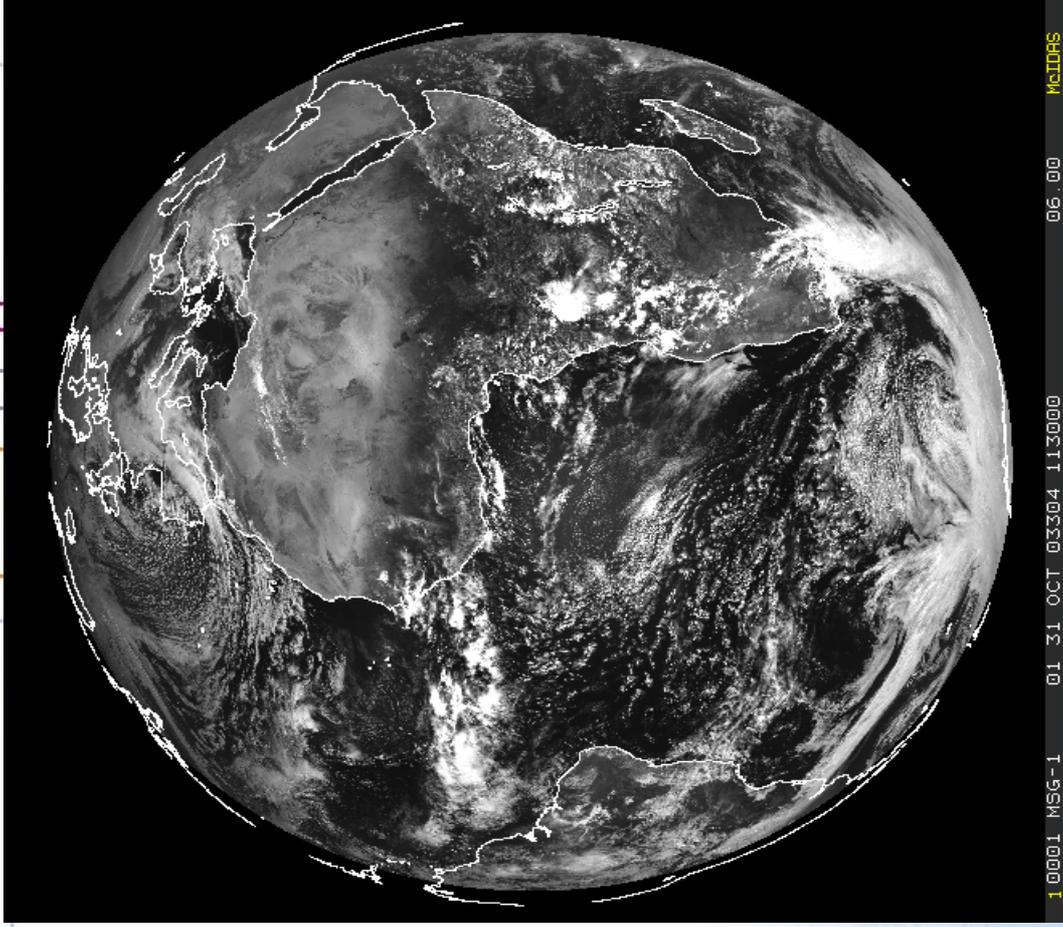
Snow

Desert

Bare Soil

Forest

Ocean, Sea



thick clouds

thin clouds over
land

thin clouds over
ocean

Low reflectance

31 October 2003, 11:30 UTC

Meteosat solar channels



Earth Surface

Channel 02 (VIS0.8)

Clouds

High reflectance 12

Sun Glint

Snow

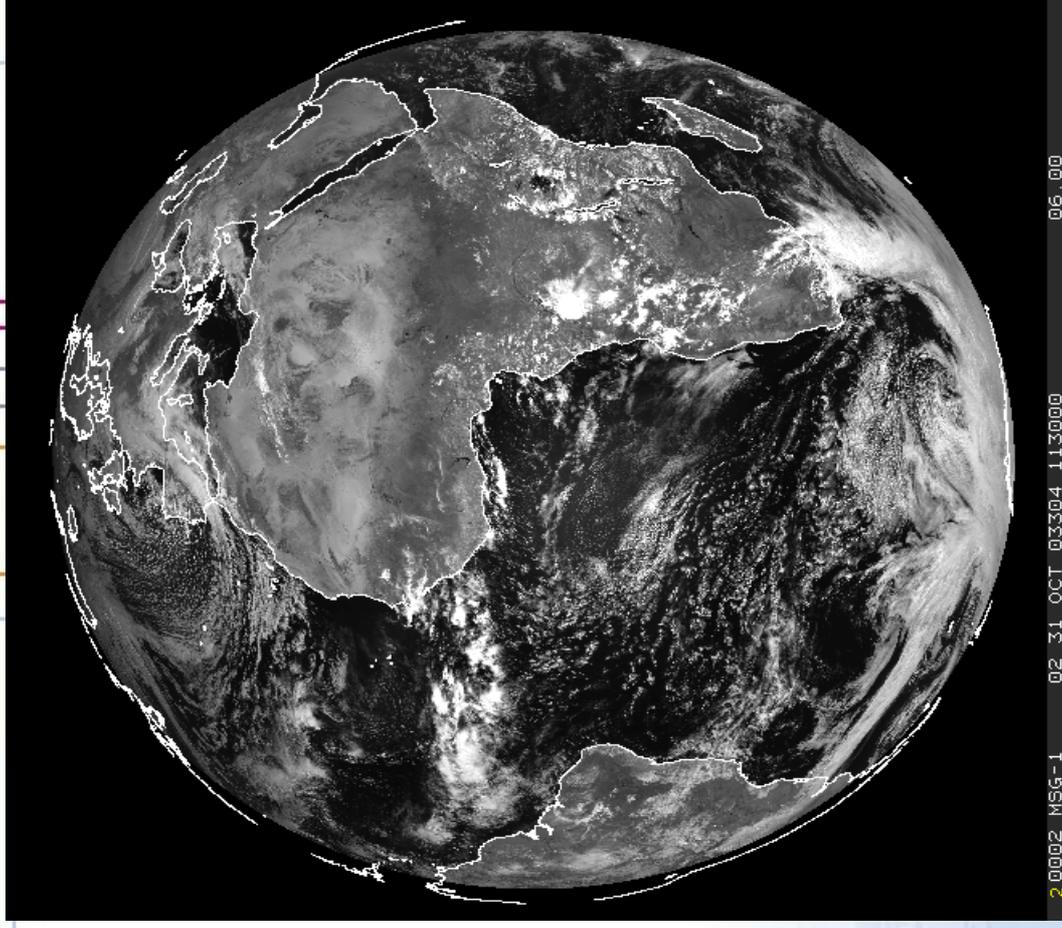
Desert

Grass, Rice fields

Forest

Bare Soil

Ocean, Sea



thick clouds

**thin clouds over
land**

**thin clouds over
ocean**

Low reflectance

2 0002 MSG-1 02 31 OCT 03304 113000 06.00

31 October 2003, 11:30 UTC



Earth Surface

Channel 03 (NIR1.6)

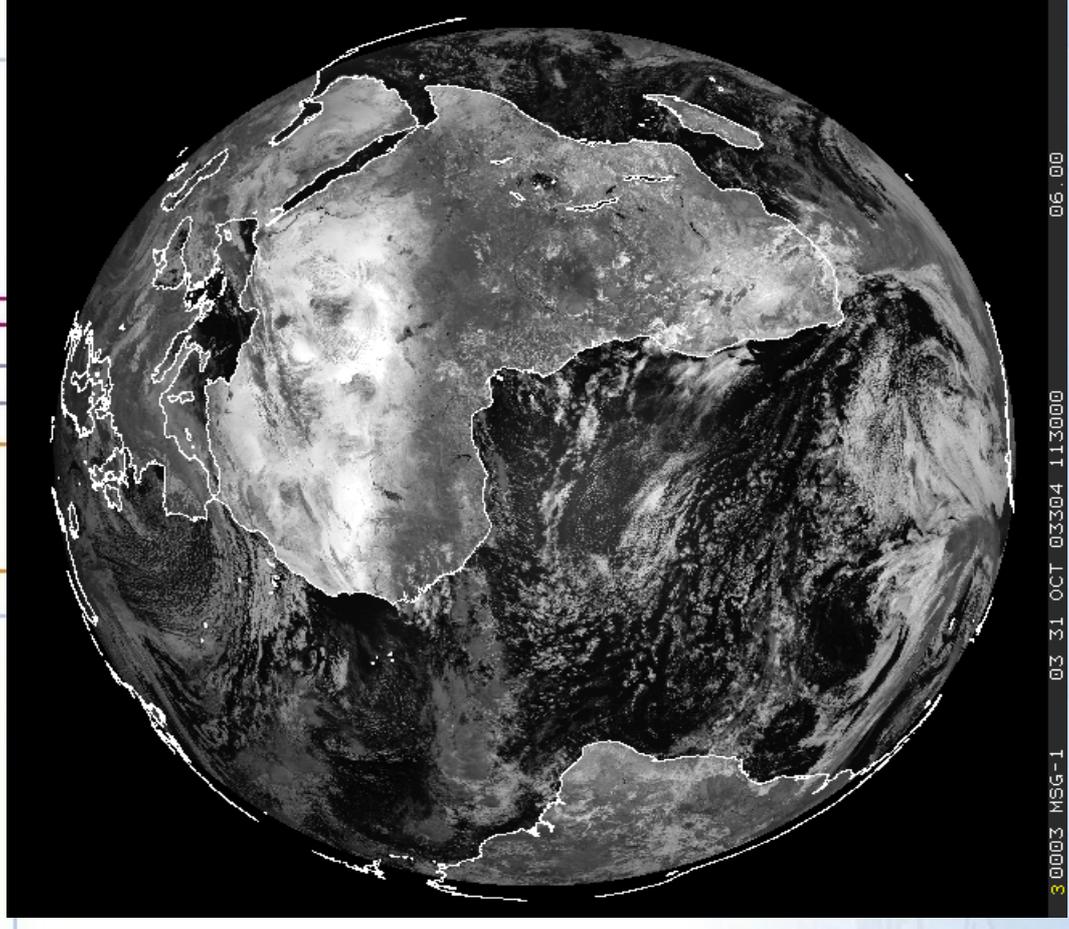
Clouds

High reflectance 13

Sun Glint
Sand Desert

Gras, Rice fields
Forest
Bare Soil

Snow
Ocean, Sea



Water clouds
(small droplets)

Water clouds
(large droplets)

Ice clouds (small
particles)

Ice clouds (large
particles)

Low reflectance

31 October 2003, 11:30 UTC



SOLAR IMAGES

0.6 μm albedo scale:

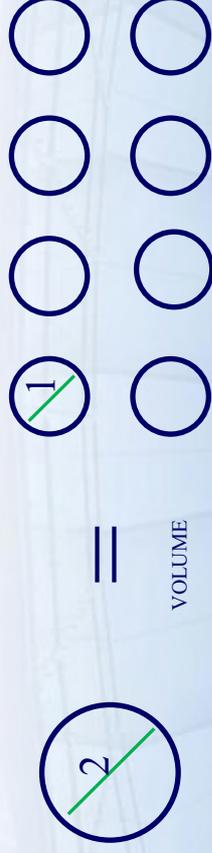
Cb Snow Sand Shallow or broken cloud Ocean

CLOUD ALBEDO is the result of:

- optical depth= **concentration** * **particle section** * **layer thickness**
- liquid or ice (phase and shape)

Small droplets more reflective?

For the same volume, which distribution presents more section to the radiation?

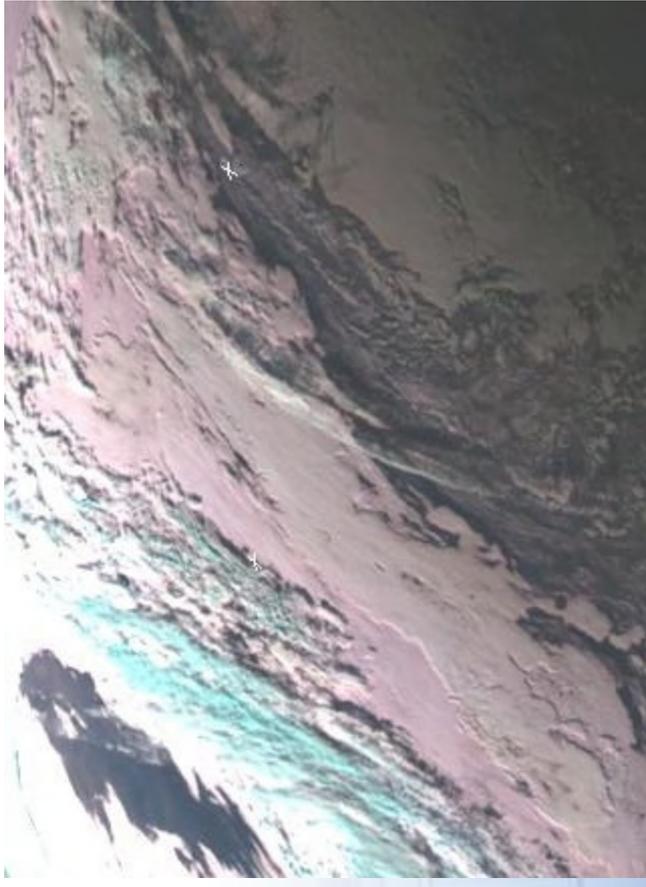
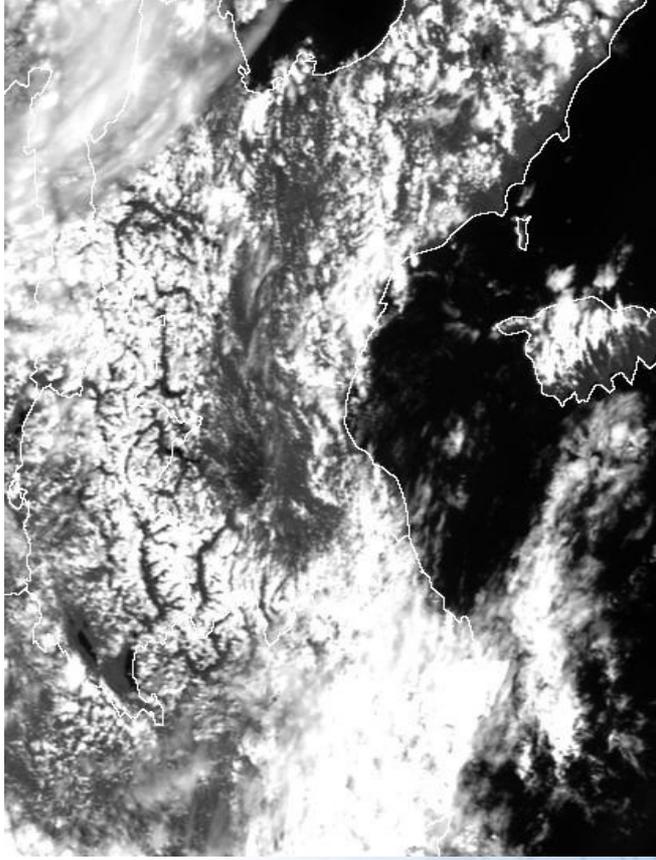


Updrafts prevent droplet merging, and keep reflection strong

Special solar features

15

- Shades:** oblique sun, vertical structure. Reflective boundaries
- Water content** is related to optical thickness thru particle size
- Texture** (local standard deviation): cloud type. Sc from St
- Clouds** versus dendritic more permanent **snow**
- Thin Ci:** frequently not detected, more visible over ocean. Better in IR



 EUMETSAT

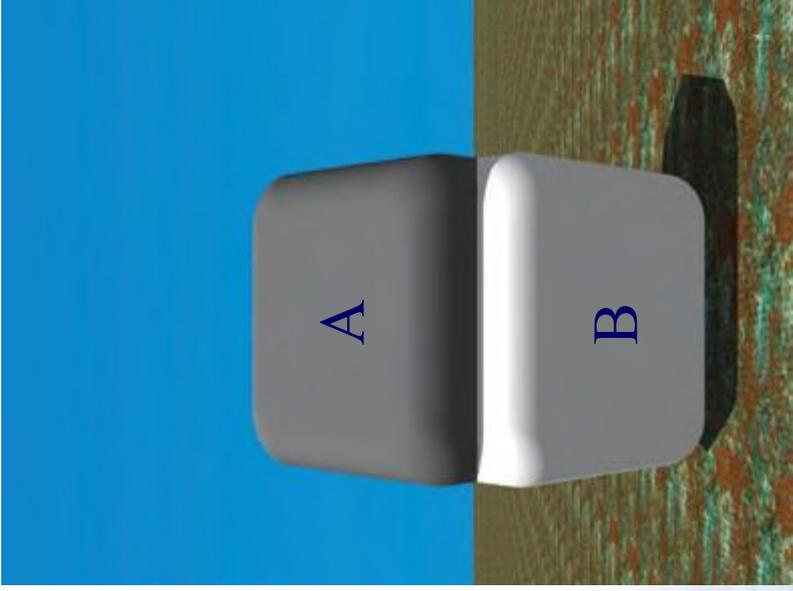
Meteosat solar channels



Meteosat-9 Atlantic Ocean around -10E -15N, 2011-05-31 15 UTC

Which mountain range is this?

Do you believe your eyes?



Which is darker: A or B ?

Believing that colour is intrinsic to objects (colour constancy)
leads to delusion