

Panel Discussion

Three most important satellite
instruments (past and future)
for large scale NWP

Graeme Kelly ECMWF

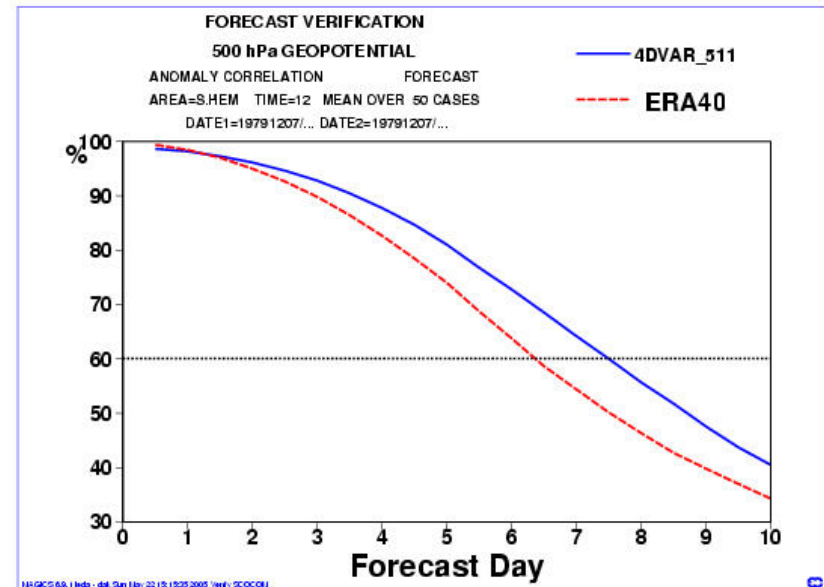
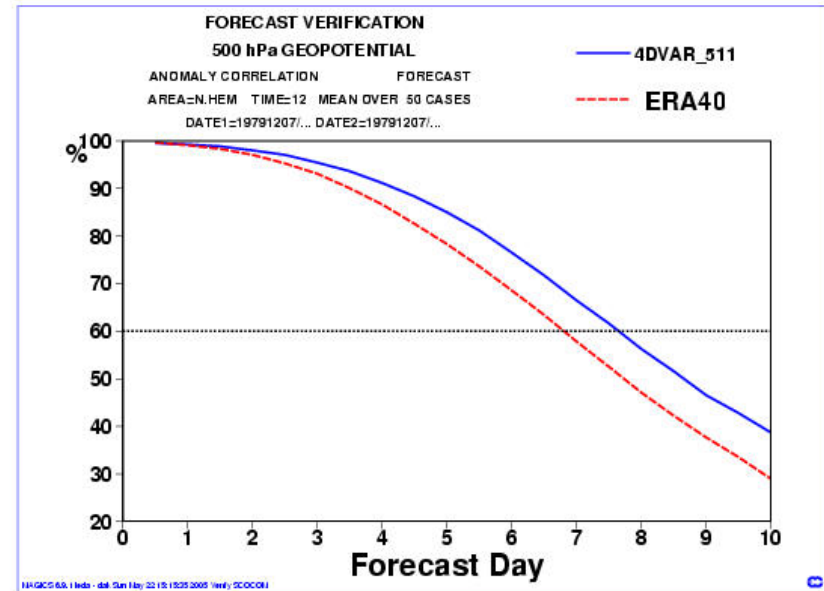
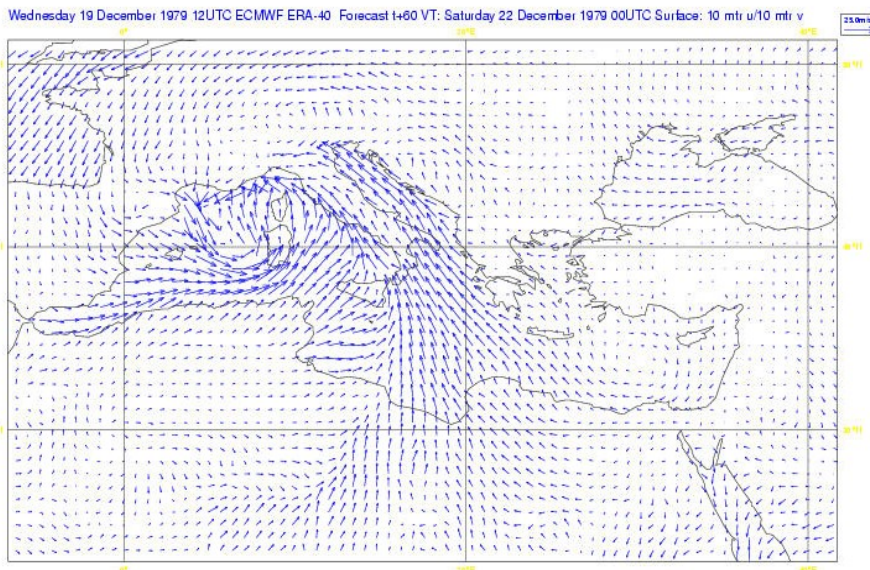
PAST

The most important satellite instrument cluster(TOVS)

- HIRS 19 IR channels and 1 VIS channel
- MSU 4 MW channels
- SSU 3 IR channels

T511/L60 Venice storm 1979 Dec the 2nd Highest tide since 1900

60 Hour forecast



2. Global Geo Sats (5)

Global AMW's

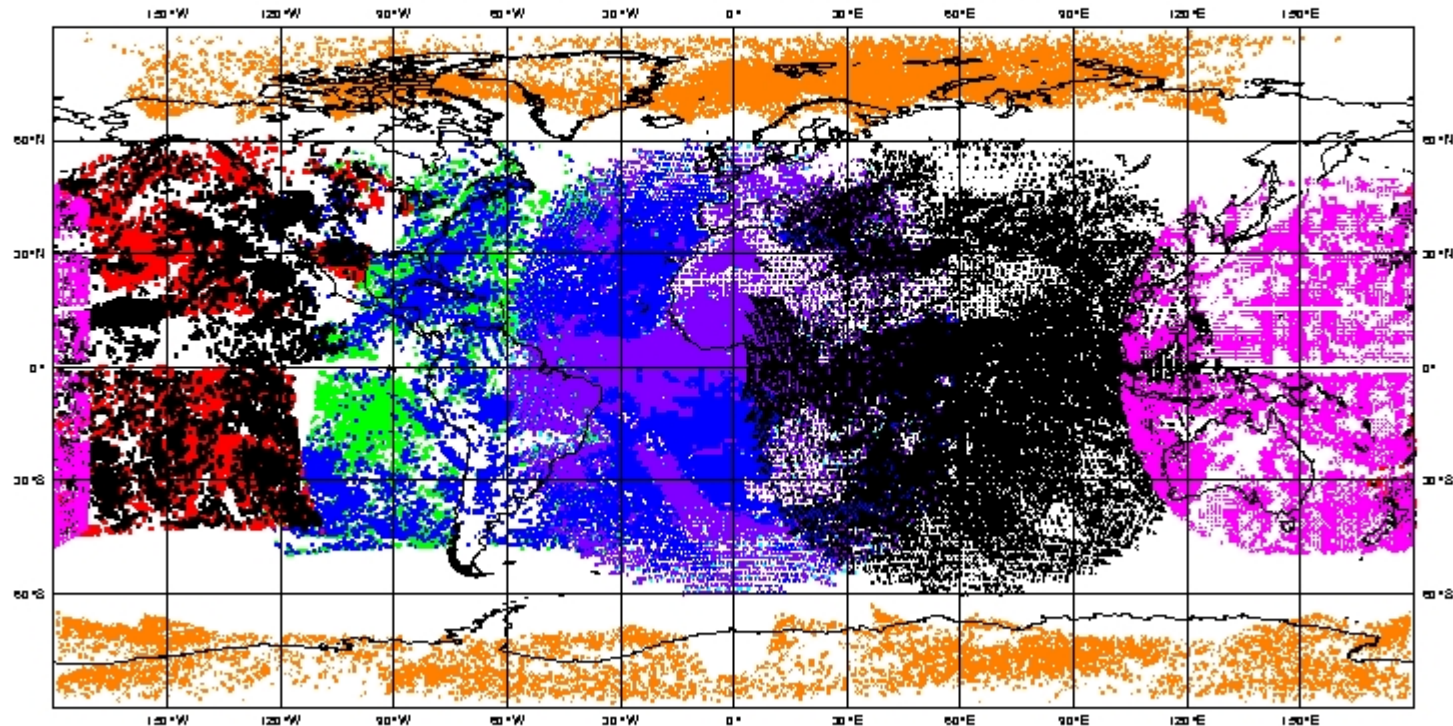
Global water vapour radiances

POLAR AND GEOSTATIONARY WINDS & RADIANCES

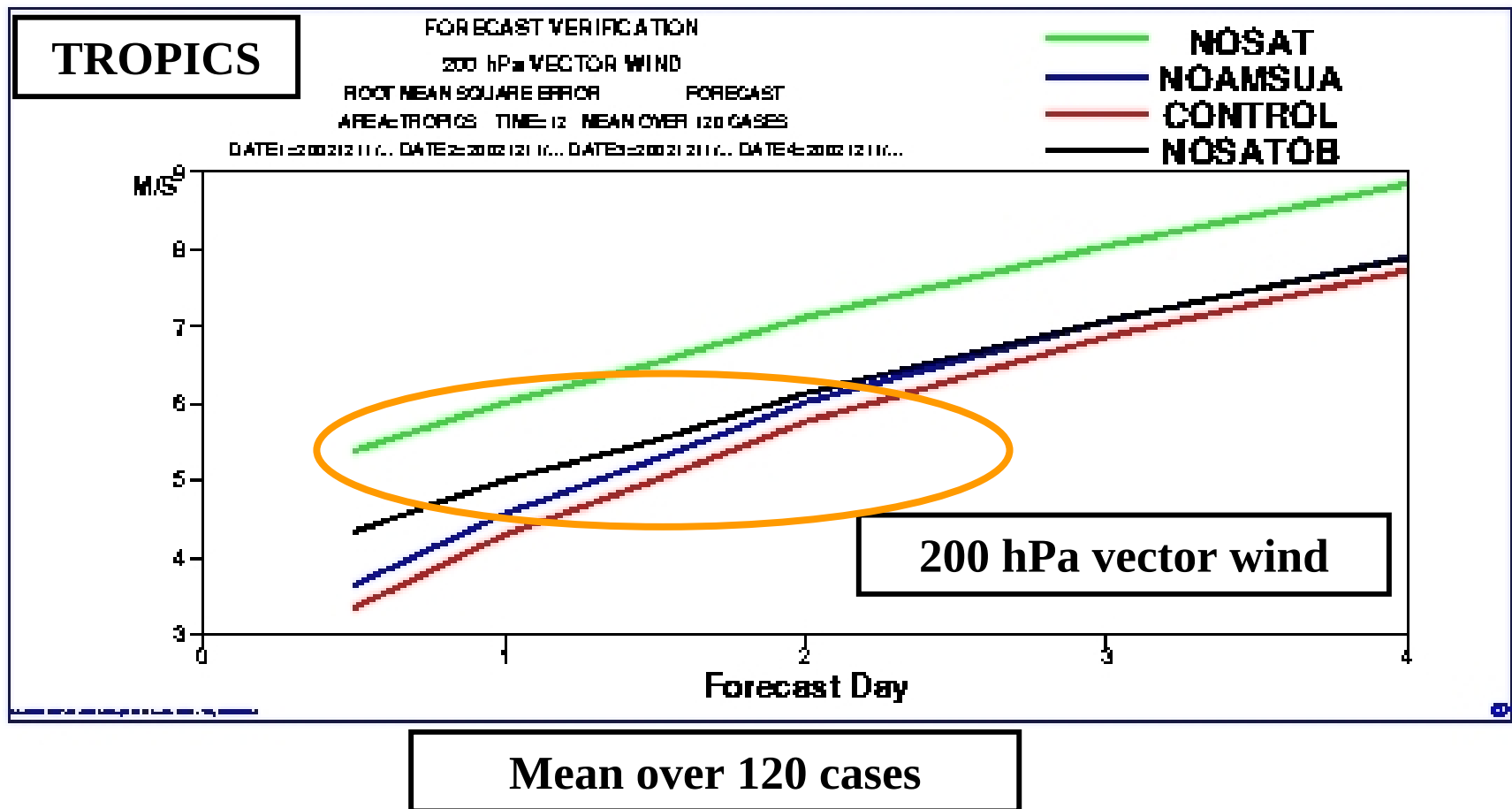
ECMWF Data Coverage (All obs) - SATOB

27/APR/2004; 12 UTC

Total number of obs = 224958



Atmospheric Motion Vectors ("SATOB")



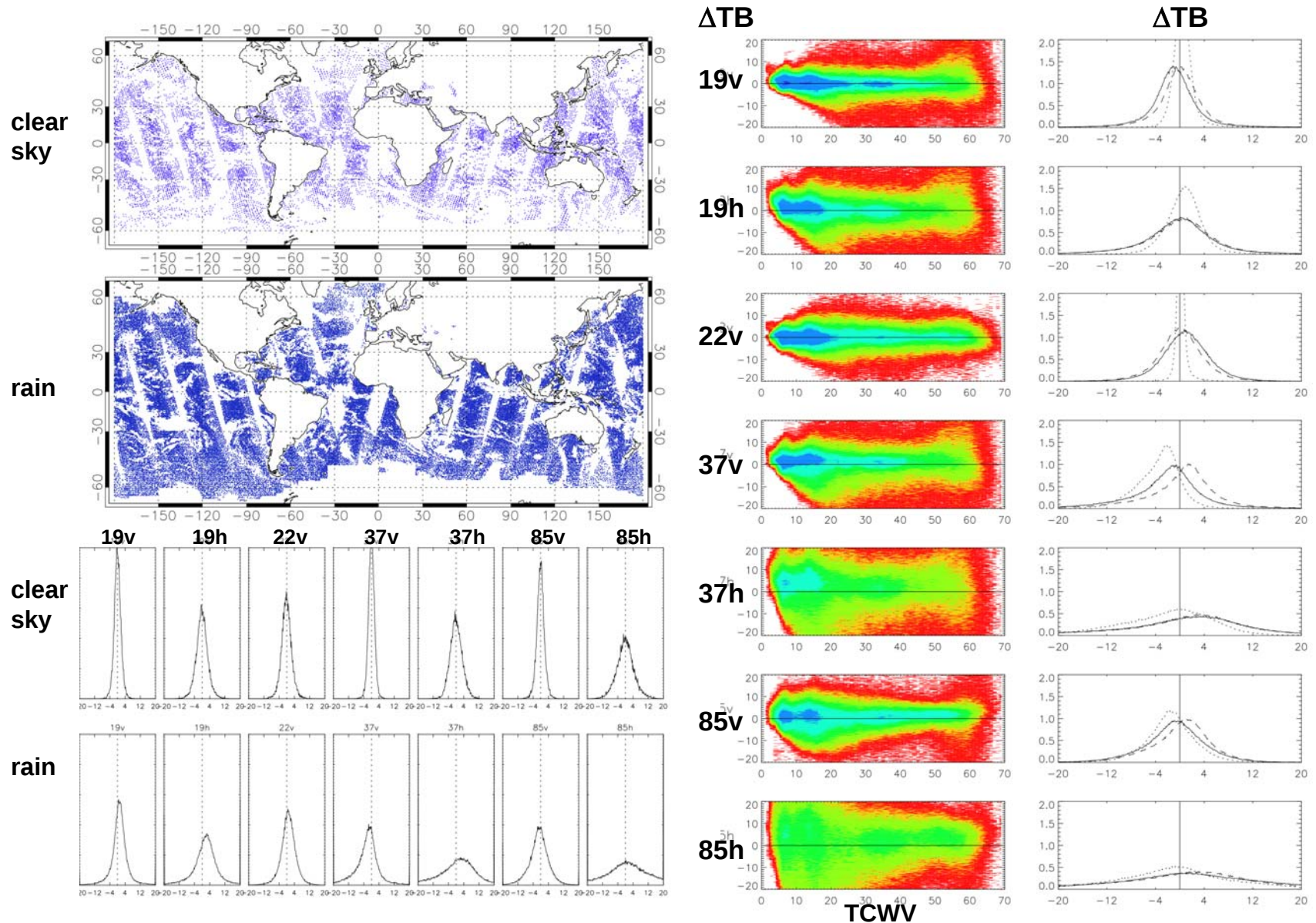
3. SSM/I(S), AMSUB

Global moisture

1D/4D-Var and cloudy radiances

- In July 2005 ECMWF introduced into operations a pre-analysis 1DVAR (using moist physics and model tendencies) to assimilate cloudy SSMI radiances.
- The 1DVAR moisture profile used then used in 4DVAR.
- We are now working on a full 4DVAR version.

SSM/I clear-sky vs. rain FG-Departures (03/08/2004 00 UTC)



FUTURE

1. The new polar satellites EPS (AMSU /IASI and NPOES (ATMS and CRIS)).

2. Doppler wind lidar (ESA ADM).

2008

3. Geostationary advanced hyperspectral sounders

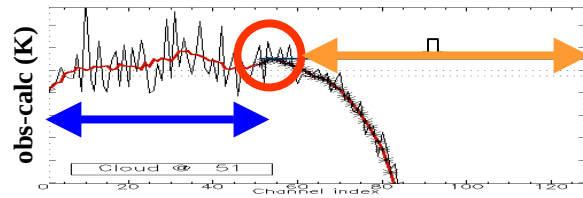
The new challenge:

Assimilation of advanced IR sounders (AIRS,IASI,CrIS ...)

- **Cloud detection**
- **Use of cloudy radiances**
- **CO₂ect**

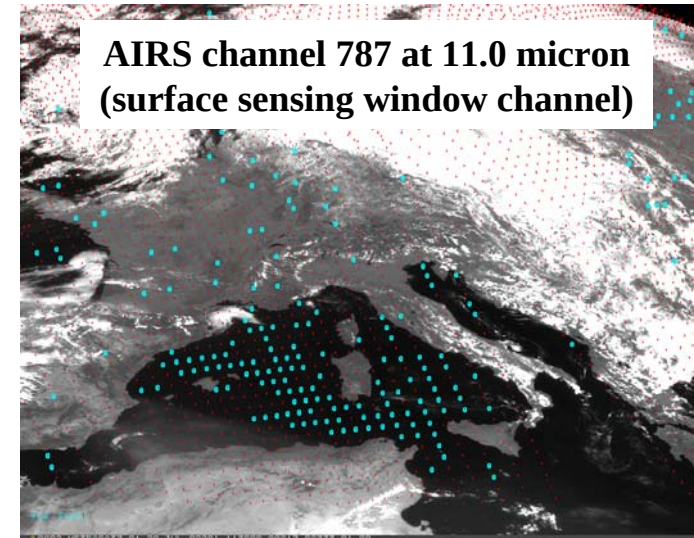
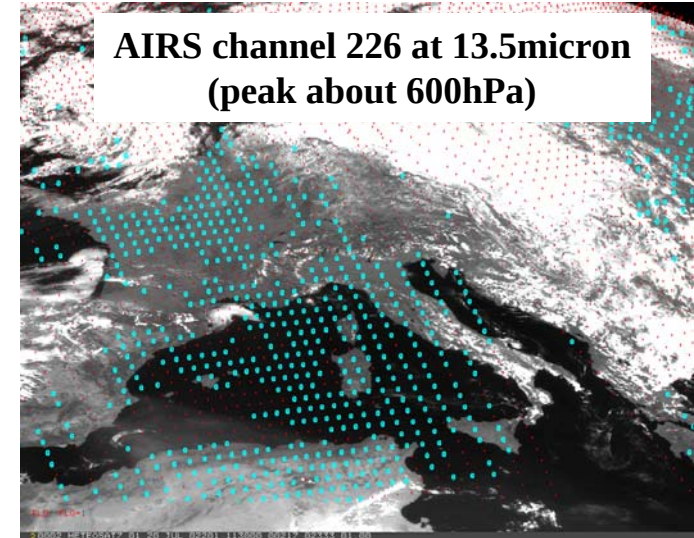
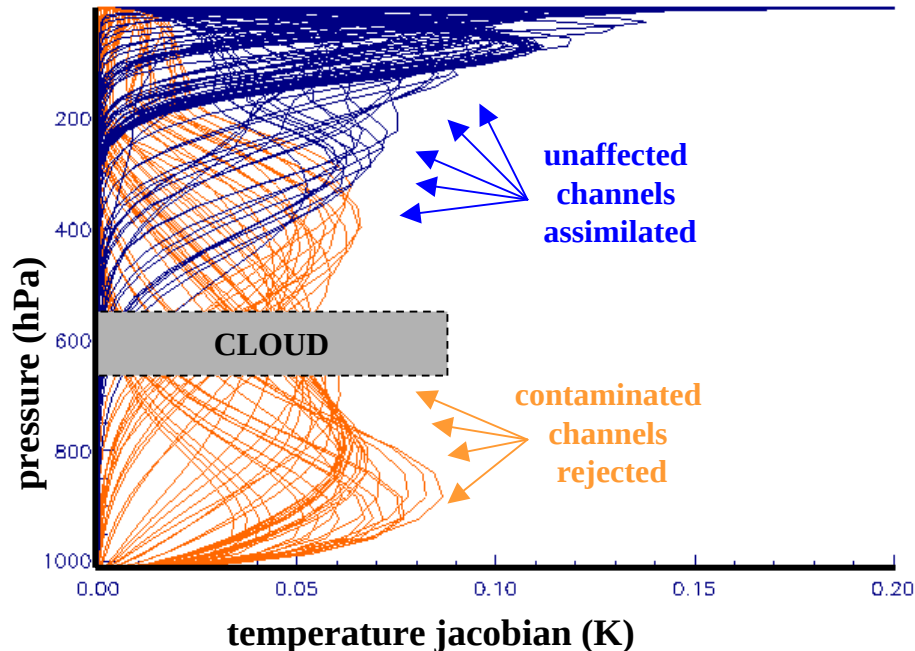
Cloud detection scheme for AIRS (IASI / CrIS)

A non-linear pattern recognition algorithm is applied to departures of the observed radiance spectra from a computed clear-sky background spectra.



Vertically ranked channel index

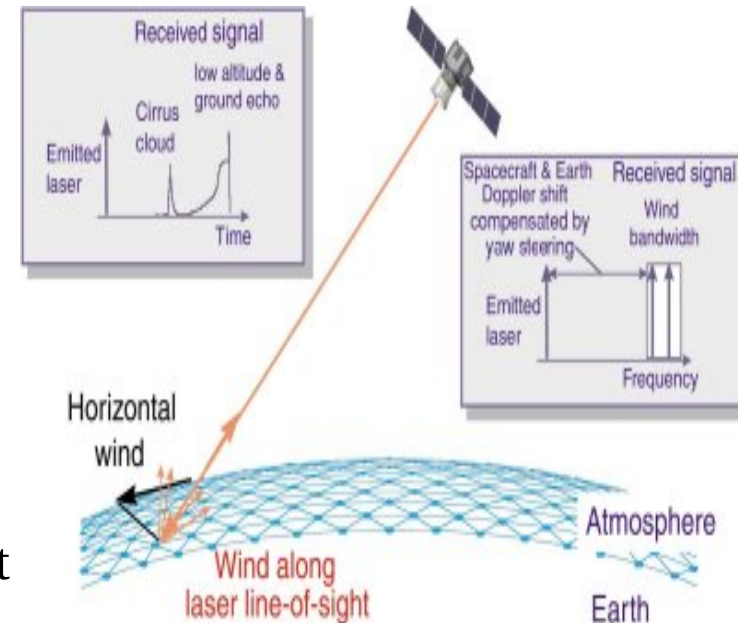
This identifies the characteristic signal of cloud in the data and allows contaminated channels to be rejected



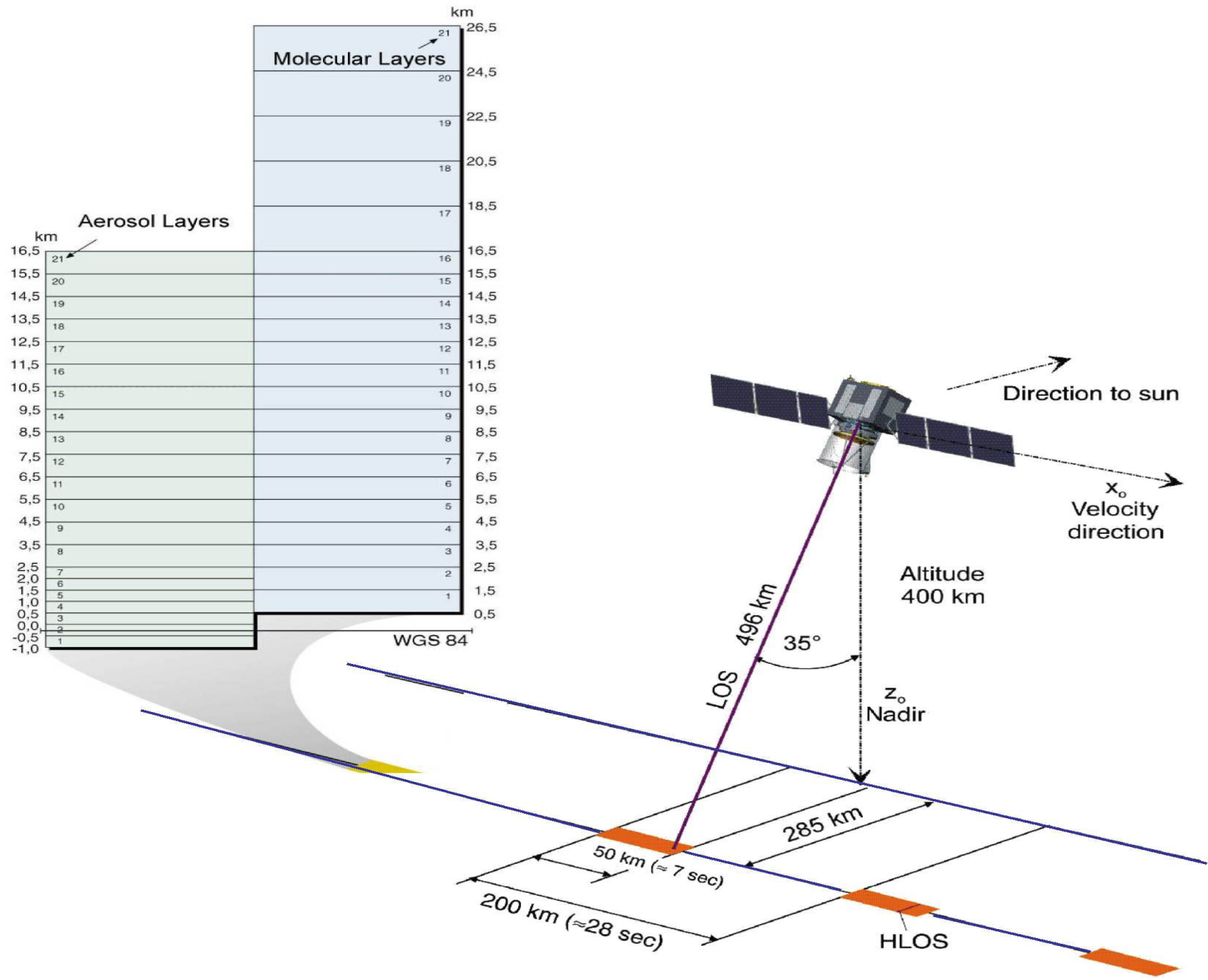
2008 Doppler Wind Lidar instrument principle (355 nm 130 nJ)

ALADIN is an active instrument which fires laser pulses towards the atmosphere and measures the Doppler shift of the collected return signal, backscattered at different levels in the atmosphere. The frequency shift results from the relative movement of the scatter elements along the line of sight of the instrument. This movement relates to the mean wind in the observed volume. The measurement volume is determined by the maximum ground integration length of 50 km, the required height resolution and the width of the laser footprint. The measurements are continuously repeated at distances of about 200 km.

ADM



ADM-Aeolus (wind lidar)



Technical specifications of the ALADIN instrument

Transmitter

Wavelength 355 nm

Pulse energy 130 mJ (150 mJ goal)

Repetition rate 100 Hz Line width 30 MHz Duty cycle 25%

Receiver

Fizeau line width (Mie) 30 MHz

Double Fabry-Perot (Rayleigh) Line width Spacing 2

GHz 5 GHz Optical efficiency (Mie/Rayleigh) 3.1% /

4.6% Detector quantum

efficiency (Mie/Rayleigh) 75%

Signal Processing

Altitude range (Mie + Rayleigh)-1 to +26.5 km
(extendable)

Vertical resolution 1 km (adjustable)

On-chip horizontal accumulation length 3.5 km
(adjustable)

Processing integration length 50 km

Opto-mechanical Subsystem

Telescope diameter 1.1 m Optical efficiency 0.8