



RAYLEIGH-MIE-RAMAN LIDAR ACTIVITIES FOR THE STUDY OF THE ATMOSPHERE AT ISAC-CNR

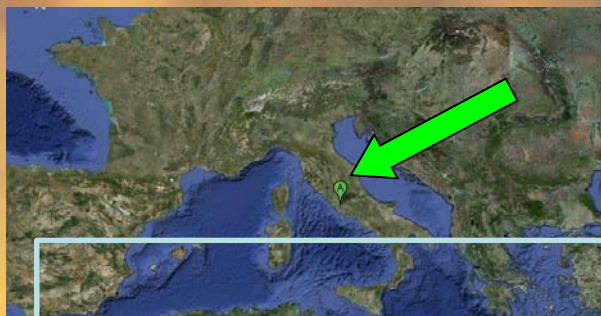


Presented by G.L.Liberti (g.liberti@isac.cnr.it)

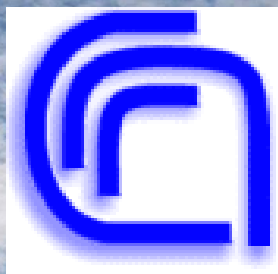
¹Institute of Atmospheric Science and Climate (ISAC-CNR), Rome, Italy

<http://lidar.ifa.rm.cnr.it/>

<http://ndacc-lidar.org/index.php?id=105/Rome-Tor+Vergata.htm>



- INSTRUMENT DESCRIPTION
- DATA DESCRIPTION
- GEOPHYSICAL PRODUCTS
- APPLICATIONS
- CRITICAL ISSUES
- OTHER POSSIBLE CONTRIBUTIONS



Rayleigh-Mie-Raman (RMR) multi-channel lidar of Rome - Tor Vergata

TRANSMITTER

Laser Nd:YAG Continuum Powerlite 8010
2 beams: 532 nm, 355 nm
Energy: 200 mJ, 400 mJ
Pulse repetition rate: 10 Hz
Pulse duration: 7 ns
Beam diameter: 45 mm
Beam divergence: 0.1 mrad



RECEIVER

Collector 1

newtonian array
Diameter: 9*500 mm
F-number: F3
FOV : 0.6 mrad

Collector 2

single newtonian
Diameter: 300 mm
F-number: F3
FOV : 0.9 mrad

Collector 3

single newtonian
Diameter: 150 mm
F-number: F3
FOV: 1.8 mrad



DATA ACQUISITION

Raman UT 387 nm
channels: 407 nm
Elastic (T): 355 nm
532 nm

Raman LT 387 nm
channels: 407 nm
Elastic
(UTLS): 532 nm

Elastic: 532 nm
(PBL, LT)

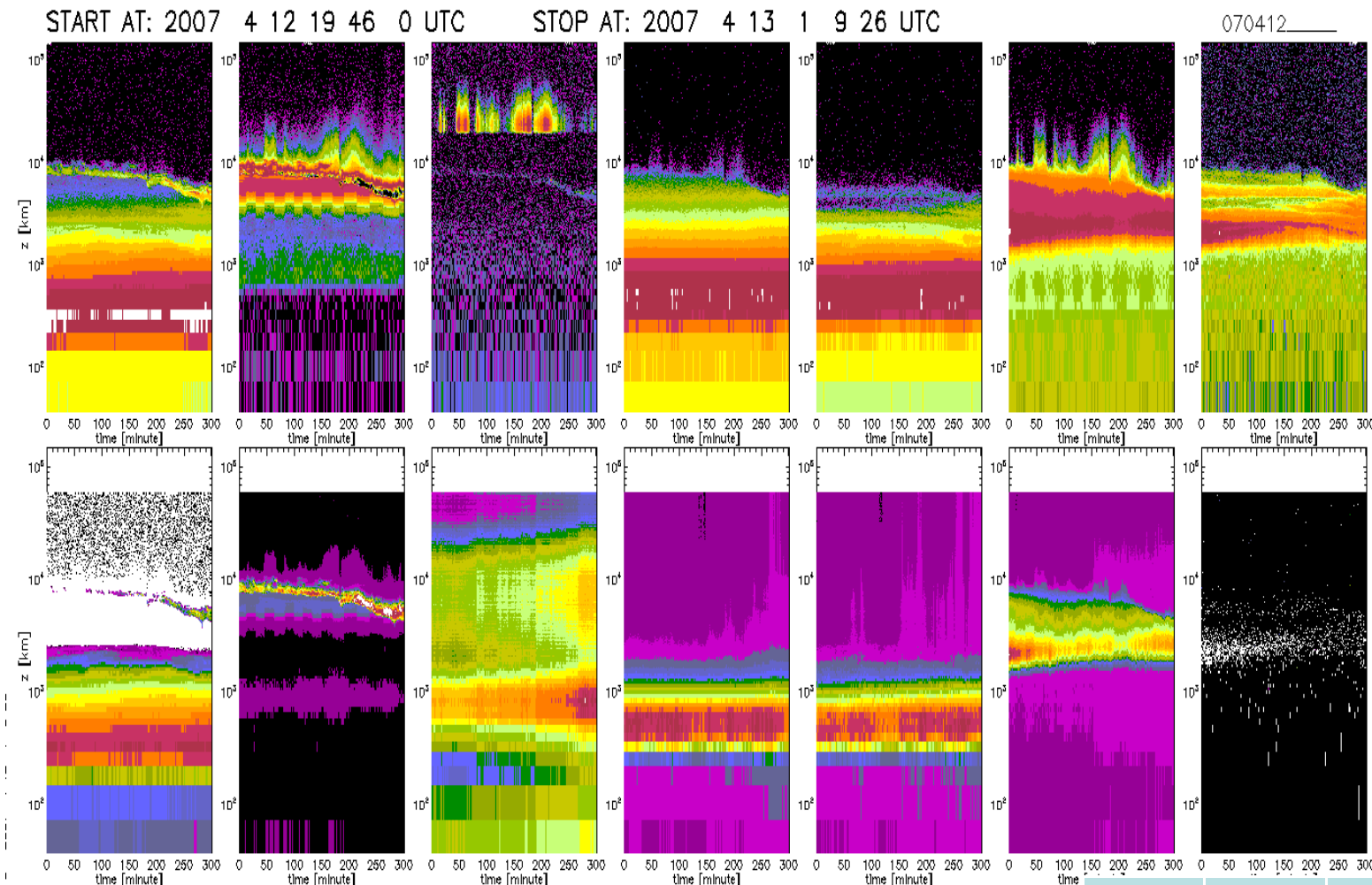
For each photo-detection channel

Photon-counting: 200 MHz Bandwidth ADC: 12 bit, 20 Msample/s
500 ns max. resolution

Rayleigh-Mie-Raman Lidar: example of measurement session (Level 0)

DIGITAL

ANALOG



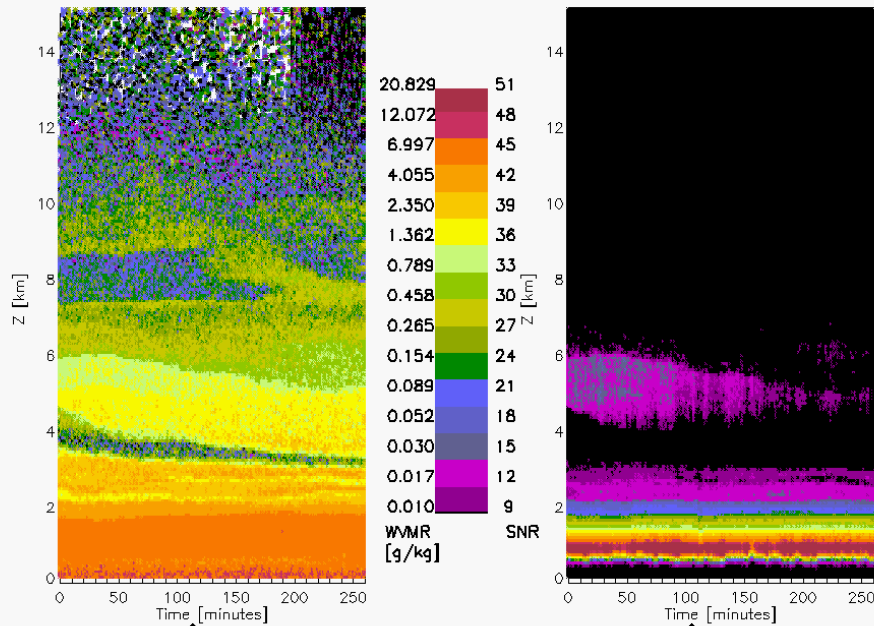
8x2 Channels (4 wavelengths, 3 telescopes)
 Total Range: $\sim 70 \text{ m} \div 150 \text{ km}$
 Δt : Standard 1' (600 profiles)
 Δz : Standard 75 m (7.5 m ANALOG ONLY)

	355	387	407	532
15 cm				1
30 cm	8	5	4	2
9x50 cm		7	6	3

REAL PRODUCT S RESOLUTION:

- Geophysical variable: channels used, algorithm, distribution.
- Signal integration: Threshold SNR, algorithm

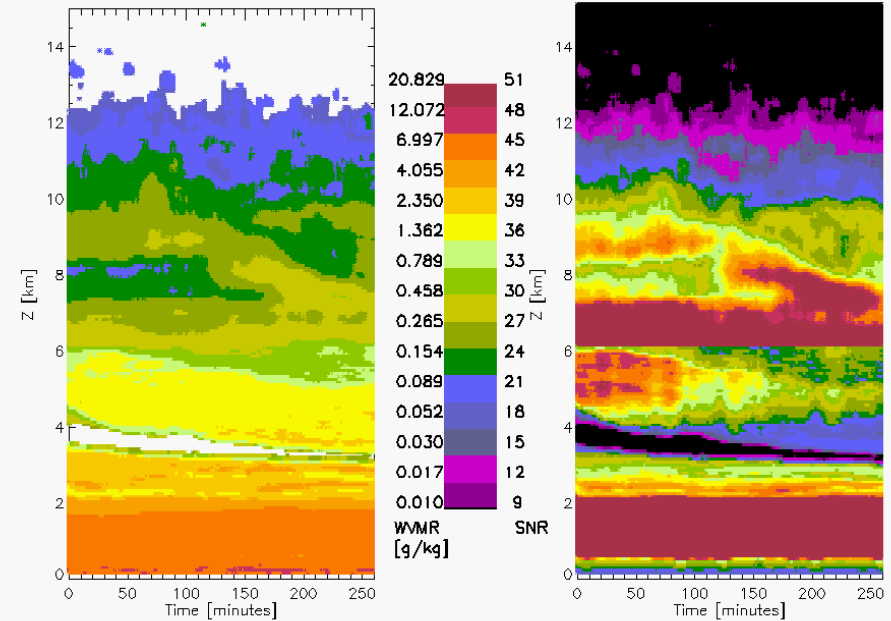
ORIGINAL 1'-75m



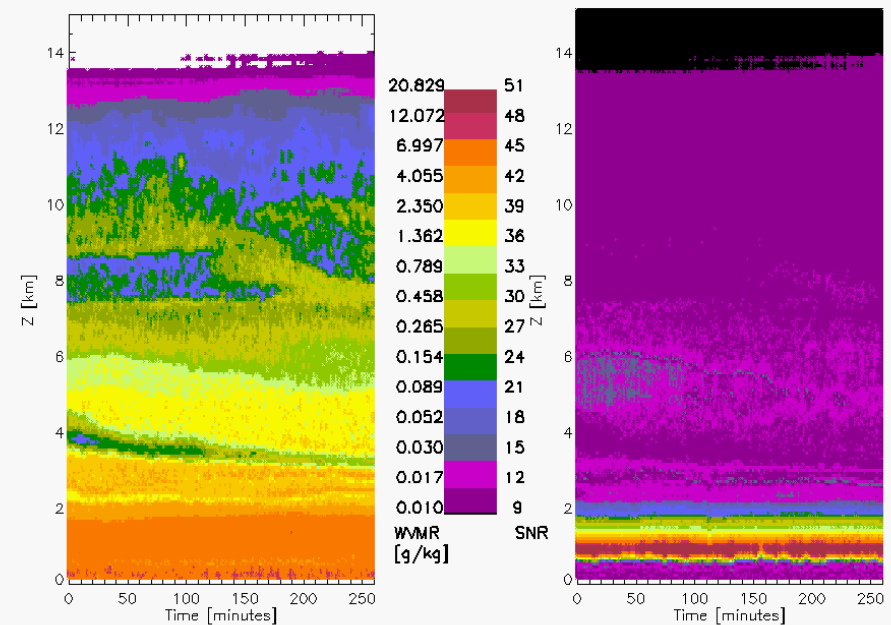
WVMR [g/kg]

SNR

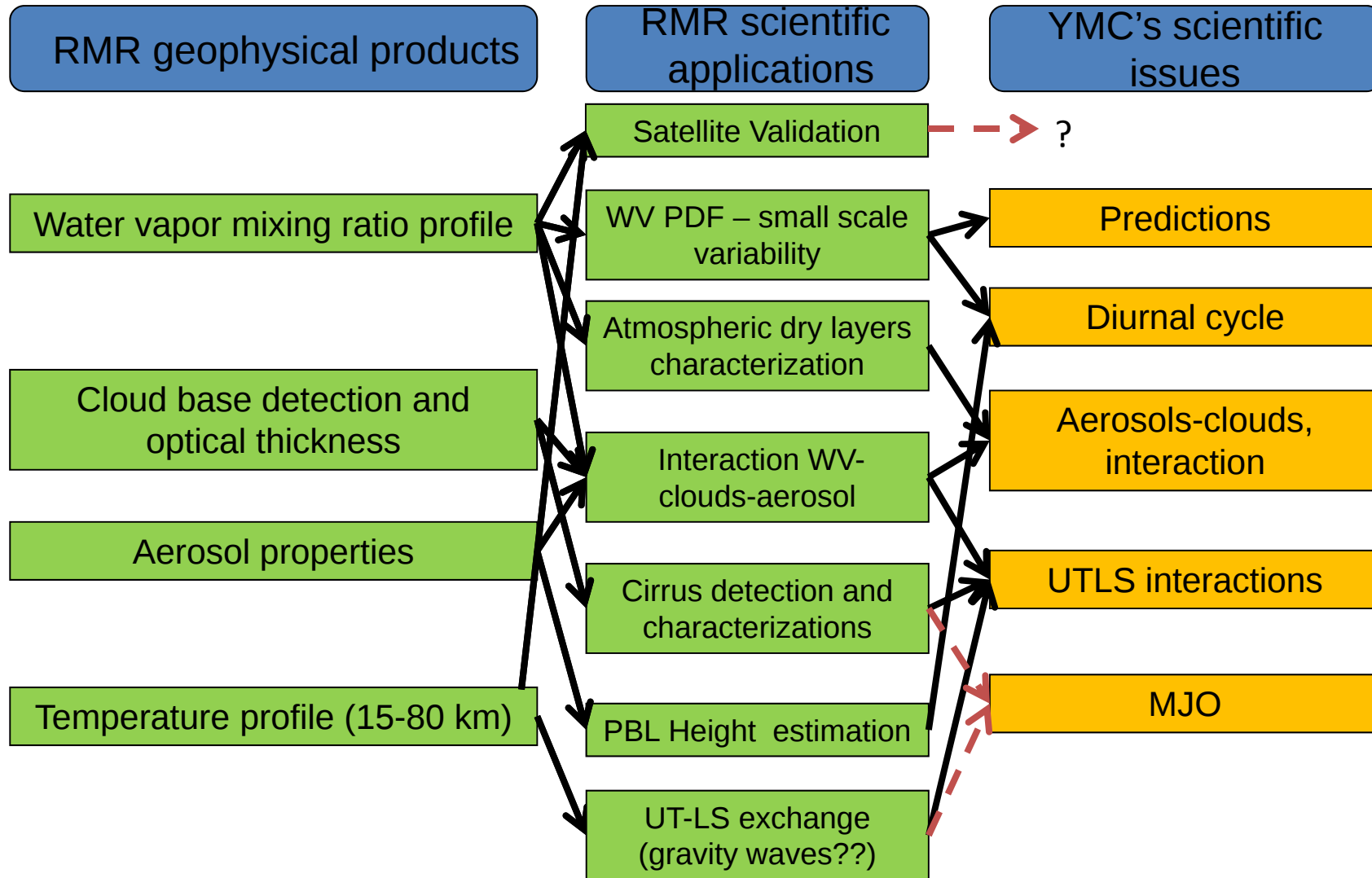
'CLASSIC' A-PRIORI FIXED BOX



SCENE DEPENDENT DYNAMIC INTEGRATION



RAYLEIGH-MIE-RAMAN LIDAR





RAYLEIGH-MIE-RAMAN (RMR) LIDAR

Institute of Atmospheric Science and Climate (ISAC-CNR)

Rome-Tor Vergata 41.8°N 12.6°E . 106 aslm



CRITICAL ISSUES

FUNDINGS

PERSONNEL

LOGISTICS: TRANSPORT, CONCRETE BASE, WATER & POWER SUPPLY

WV MIXING RATIO CALIBRATION (NEARBY RADIOSONDE AVAILABILITY, GPS)

DAYTIME REDUCED SOUNDING RANGE

OPTICALLY THICK CLOUDS (NO WV, TEMPERATURE and AEROSOLS PROFILES
ABOVE THE CLOUD BASE)

PRECIPITATION (NO OBS)





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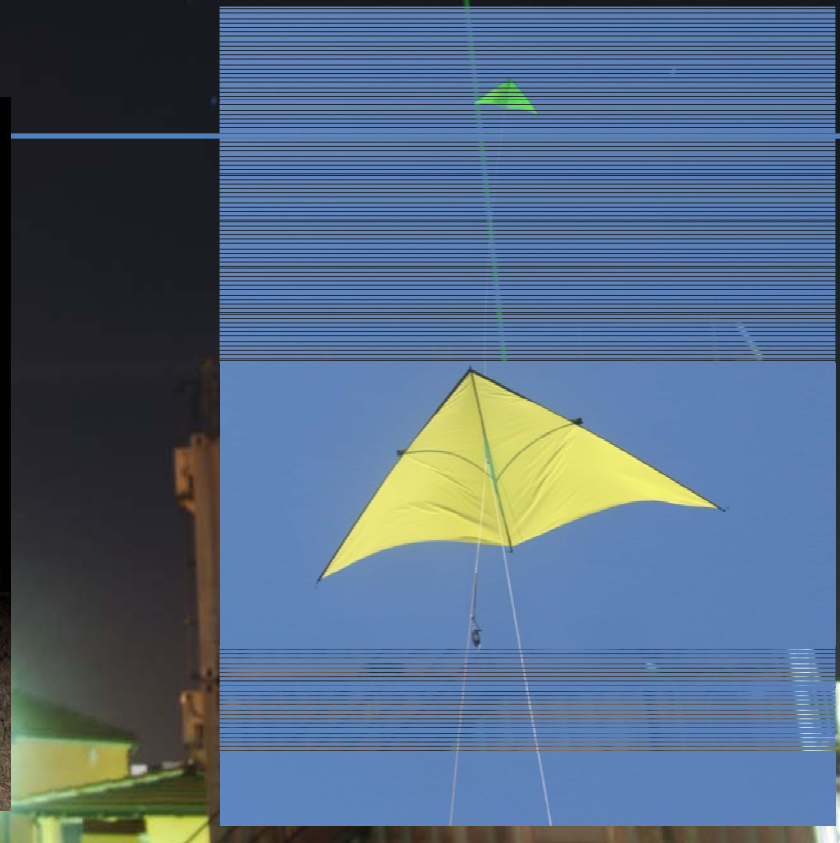


ADDITIONAL CONTRIBUTIONS

PBL SOUNDING (THETHERED BALLOON/KITES)

NUMERICAL MODELING

LINK WITH STRATOCCLIM ACTIVITIES





Thank you!



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What would be the best (science & logistics) site?

- **Size of the instrument: 6.5x2.5xH6.5 m (ISO 20)**
- **Area required to locate the instrument: 50 m²**
- **Access: must be guaranteed to an air-ride trailer incorporating a crane**
- **Security/site surveillance: required throughout the entire campaign period because of the presence of expensive instrumentation**
-
- **Infrastructures/storage areas needed:**
- **Rest-rooms,**
- **Storage areas (3x2)m²**
-
- **Power supply (freq., voltage, power) –autonomy – necessary infrastructure (water, oil, etc...) :**
- **Power supply (freq.): 50 Hz**
- **Power supply (voltage): 220 Volt**
- **Power supply (power): min 6 kW (i.e. 2 kW for laser source and 4 kW for receiver/data acquisition system/AC) peak 10 kW**
- **Running water: 5-7 l/min**