Centre for **A**tmospheric **RE**mote **S**ensing and **S**pace **E**arth observation

CARESSE

Infrastructure and scientific goals

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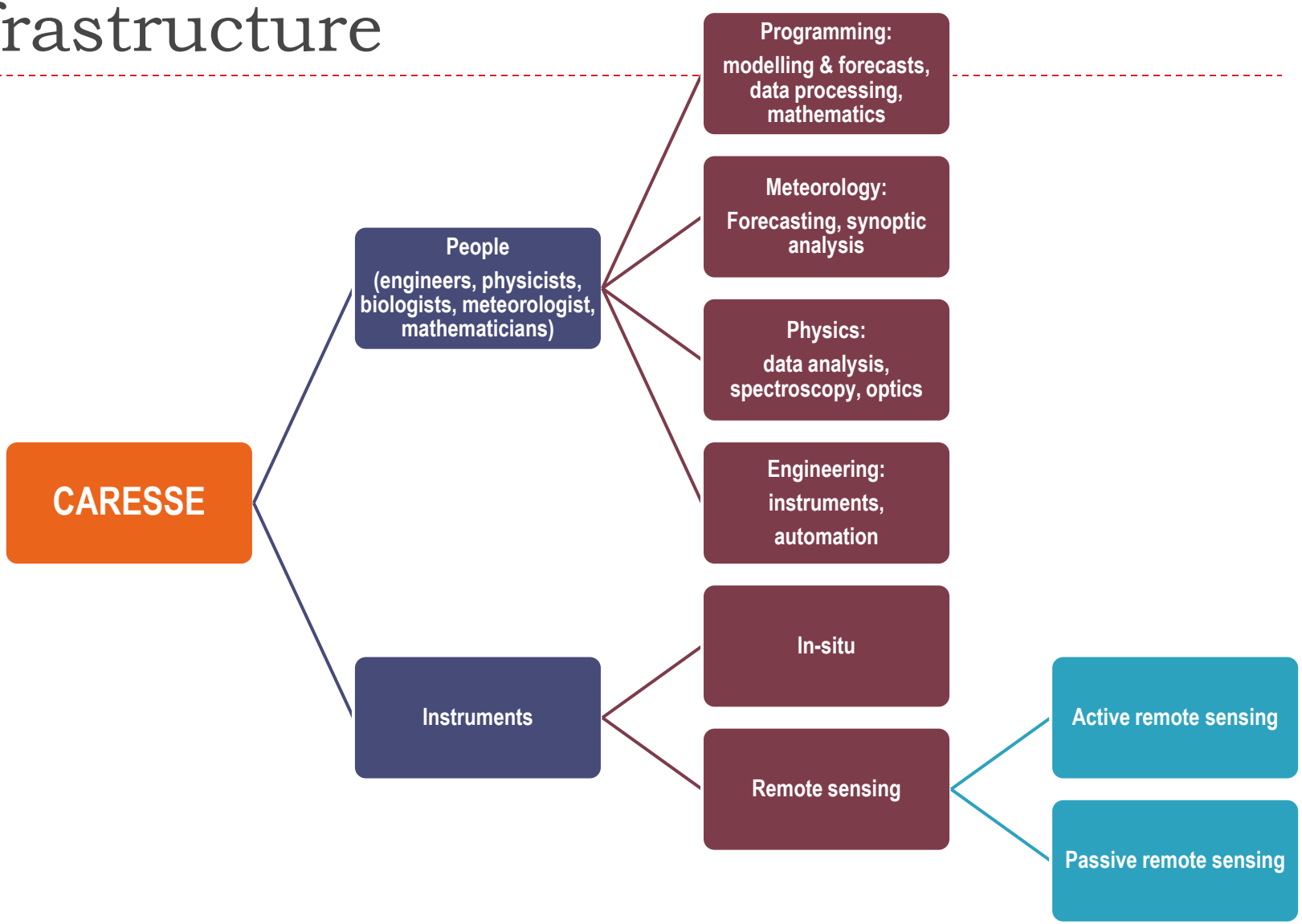
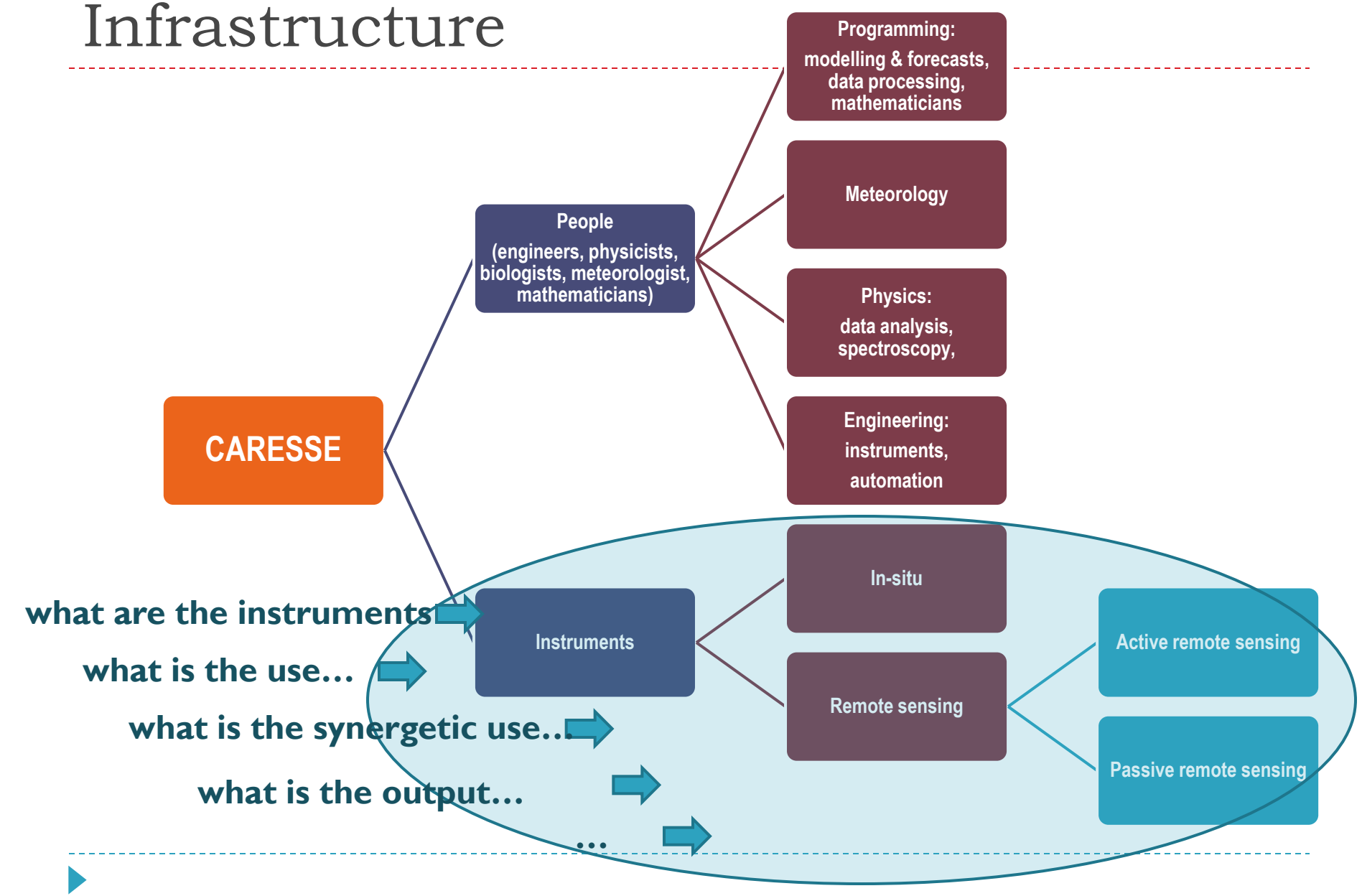
Infrastructure



Infrastructure



Infrastructure

Other

- EUMETCAST
- MAP3D (air quality forecast)

In situ

- **C-ToF Aerosol Mass Spectrometer, ACSM**
- Aerodynamic Particle Sizer,
- Nephelometer, Aethalometer
- **Gas analyzers** + UV VIS DOAS
- Meteorological sensors

Passive remote sensors

- **Microwave radiometer**
- Sunphotometer
- UV & IR cameras

Active remote sensors

- **Elastic lidar**
- Multiwavelength Raman lidar
- **UV scanning, eye-safe lidar**
- Ozone lidar
- SODAR

http://environment.inoe.ro/article/81/field-campaigns

Infrastructure

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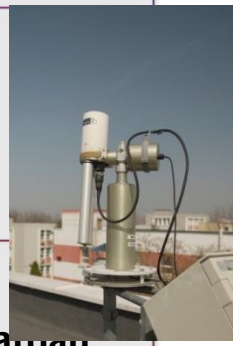


Active remote sensors

- Elastic lidar
- **Multiwavelength Raman lidar**
- UV scanning, eye-safe lidar
- Ozone lidar
- SODAR

Infrastructure - products

- in-situ
  - Aerosol Mass Spectrometer: combines mass spectrometric detection with particle time-of-flight in order to investigate the concentration, chemical composition and fine aerodynamic dimensions of aerosols. It is able to perform continuous monitoring of a complete mass spectrum
  - The Aerosol Chemical Speciation Monitor (ACSM): can be used for continuous monitoring of submicronic non-refractory aerosols chemical species in the mass spectrum range 1-400 amu
  - Aerosol Particle Sizer: is a high performance instrument providing measurements on aerodynamic diameter of aerosols and relative light scattering intensity. The instrument provides the size distribution of particles using time-of-flight technique on 0.5-20 µm particles
  - Integrating Nephelometer: provides long-term monitoring of air quality in ground-based and airborne studies. It continuously monitors the light scattering coefficient of airborne particles
  - Aethalometer: instrument is used for measuring the concentration of optically absorbing ('black') suspended particulates
  - + Meteorological sensors

ACSM and EMEP station

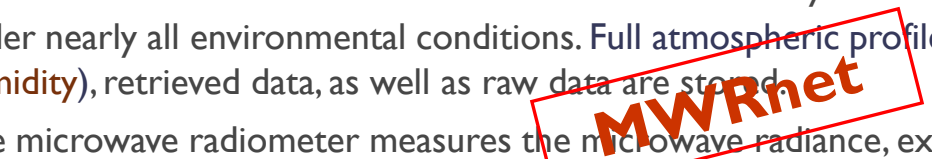
ACSM: http://www.psi.ch/acsm-stations/acsm-and-emep-stations

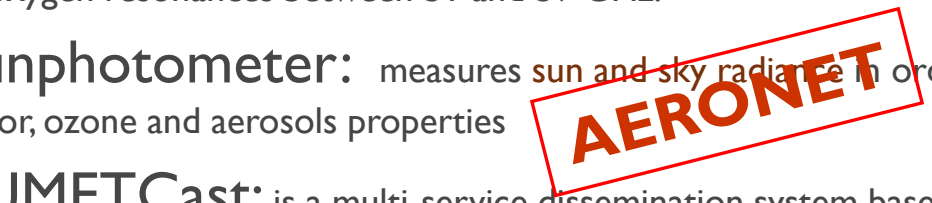
Infrastructure - products

- in-situ
  - The DOAS system: has a capacity of measure of 200-750 m atmosphere path length, the time interval for one measurement of one (or several) gas concentration is not more than 3 minutes, 205-460 nm spectral range of measurements, 0.18 nm wavelength accuracy, up to 37 gases measured simultaneously, below 1 ppb detection limit.
  - The output data consist in gases concentration and their residuals. (Considered in-situ: ground based measurements)
  - The ambient monitors: measure gas concentrations using classical methods such as the cross-flow modulated semi decompression chemoluminiscence method (for NOx monitor), UV fluorescence (SO_2monitor), non-dispersion cross modulation infrared analysis method (CO monitor), ultraviolet absorption method (O_3 monitor), cross-flow modulated selective combustion type method combined with a hydrogen ion detection method (NMHC and CH_4 monitor) and gas filter correlation spectroscopy (CO_2).
  - The output results are average, integration values and rolling average concentration with an integrating time of 3 minutes

Infrastructure - products

- passive remote sensing
  - Microwave Radiometer: is a stand-alone system for automated weather-station use under nearly all environmental conditions. Full atmospheric profiles are derived (temperature and humidity), retrieved data, as well as raw data are stored.
  - The microwave radiometer measures the microwave radiance, expressed as brightness temperature, at 14 frequencies near the water vapor resonance centered at 22.235 GHz and 7 frequencies in the band of oxygen resonances between 51 and 59 GHz.
  - Sunphotometer: measures sun and sky radiance in order to derive total column water vapor, ozone and aerosols properties
  - EUMETCast: is a multi-service dissemination system based on standard Digital Video Broadcast (DVB) technology. It uses commercial telecommunication geostationary satellites to multicast files (data and products) to a wide user community.
  - It can provide space-based observations from the Meteosat, Metop, Jason-2, GOES, MT-SAT and FY2 satellites. At their most frequent, these data are delivered to users within five minutes of processing.





MWRnet: http://cetemps.aquila.infn.it/mwrnet/
AERONET: http://aeronet.gsfc.nasa.gov/

Infrastructure - products

- active remote sensing
  - Multiwavelength Raman depolarization Lidar RALI: detects the Raman backscattering radiation from atmospheric water vapor, nitrogen, and Mie / Rayleigh backscattering radiation from atmospheric molecules and aerosol particles.
  - The output parameters are the backscatter coefficient, the extinction coefficient, water vapor mixing ratio, particle depolarization ratio (for 532nm)
  - The UV depolarization eye-safe Lidar MILI: detects Mie/Rayleigh backscattering from atmospheric molecules and aerosol particles.
  - The output parameters are the backscatter coefficient and the particle depolarization ratio (for 355 nm).
  - The Ozone Differential Absorption Lidar OLI: is based on differential absorption of optical radiation from atmospheric molecules. This technique is used to measure atmospheric gas concentration.
  - The final output of this system is vertical profile of ozone concentration up to 12 km with a resolution of few hundred meters.

EARLINET

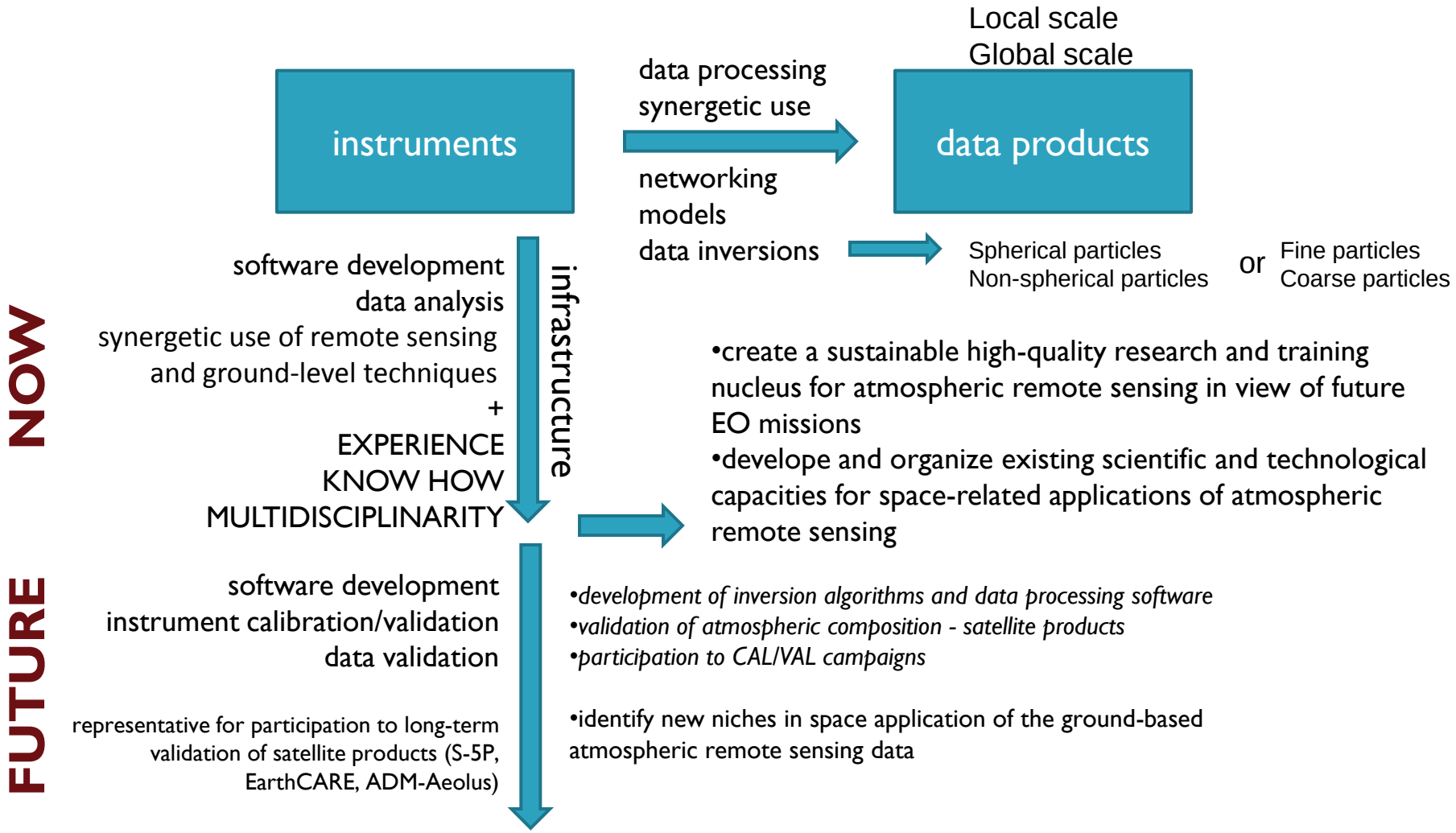
ACTRIS

EARLINET: http://www.earlinet.org/
ACTRIS: http://www.actris.net/

Infrastructure - products

- active remote sensing
  - The IR-VIS aerosol lidar: detects the Mie / Rayleigh backscattering radiation from atmospheric molecules and aerosol particles.
  - The output parameter is the backscatter coefficient and color ratio (1064 and 532 nm).
  - The Sodar: (*sonic detection and ranging*) system is used to remotely measure the vertical turbulence structure and the wind profile of the lower layer of the atmosphere.
  - The output parameters are: wind profiles, time series, vector plot, contour plot (smooth or raw).

Infrastructure – products and goals



Final remarks

- The combination of lidar observations with in situ measurements and models provides a unique opportunity to conduct long-term inter-calibrations and complementary or simultaneous monitoring of different atmospheric parameters over various space-time scales

- Based on the quality of the existing infrastructure, expertise and scientific records achieved in only five years, the infrastructure is an ideal candidate for an atmospheric remote sensing centre in Romania, contributing to space EO programs.

Thank you