NEEDS
- LCLWTS : Impact of SO₂ and Stratospheric aerosols on climate.

- AERIAL SAFETY
  The danger resulting from volcanic explosion has justified the opening by OACI of 9 Volcanic Ash Activity Centers (VAAC) in charge of monitoring and alert

OBJECTIVES
- Mapping of sulfur dioxide or aerosol, Mass loadings, conversion SO₂ to H₂SO₄ transport, deposition, Radiative properties.
- Identification of ash amount, altitude, transport

SATELLITE MONITORING

Current status
Satellite is the unique tool
Data Used :
- GOES, AVHRR, TOMS, HIRS
- SEVIRI, SCHIAMACHY, AIRS

WHAT IASI COULD BRING ?

IASI
- Fourier transform spectrometer on Metop
  +15 years of high quality data
- Spectral range: 2760 to 645 cm⁻¹
- Spectral resolution: 0.35 to 0.61 cm⁻¹
- Radiometric performances
- Spatial sampling

SIMULATIONS

SO₂ only
- Modelling Radiances
  - IA (version 4AOP)
  - Includes continuum (CKDZ2.0), H₂O, CO₂, N₂O, CO, CH₄, SO₂, HNO₃, CFCs.
  - Simulation for HIRS 3 (NOAA 16), AIRS, IASI
  - Profiles P.T.U from Raob Tunis 28/09/02 02Z
  - 10 profiles SO₂ around 8 km for sensitivity study

AEROSOLS

SO₂ DETECTION AND CHARACTERIZATION WITH IASI

- Use channels at 1178, 1559, 2500 cm⁻¹
- Use mid-resolution at 1210 cm⁻¹
- Maps of SO₂ : The T210s (01270, 1178.75, 1466.2, 1466.5, 1466.75, 1559 and 1564.5, 1385, 1178.5)
- Dense SO₂ (A = 5) and evaluate if amount is High, Medium or Low
- Best estimate with different methods :
  - Local Differential absorption
  - Conserve with clear pixels
  - Differential absorption with monochromator
- Then, with the retrieved column and the corrected temperature profile, estimate radius at 1350 with different MA levels. Select by minimization.

VOLCANIC CLOUD
- Volcanic eruption releases gases (H₂O, SO₂, HCl etc.) and aerosols (ash, sulfates)
- Processes are relatively known and documented
- Composition is highly variable
- Particle size varies with time
- Several stages of development during the first hours
- Altitude, vertical extent of cloud varies
- Lifetime is a function of particle size and SO₂ of the altitude

Environmental factors that weaken or obliterate the negative 4-5 BTD signal

1. Early opacity of gases (blocks transmission)
2. High cold point (Albedo) blocking
3. Aerosol plume (H₂SO₄)
4. Convective cloud (low BTD around cloud)
5. High altitude volcanic cloud (poor BTD around cloud)

TRANSMITTANCE

BRIGHTNESS TEMPERATURE

Having a better resolution than AIRS and a better spectral coverage of SO₂ bands IASI is very promising for Volcanic activity and climate monitoring