

# Earth Observation Activities at Imperial

Dr Helen Brindley, Space and Atmospheric Physics

(with contributions from Professor Jo Haigh, Dr Apostolos Voulgarakis, Dr Jacqueline Russell, Dr William Ball, Dr Christopher Dancel, Professor Colin Prentice, Dr Jian-Guo Liu, Professor Cedo Maksimovic, Dr Li-Pen Wang, Susana Ochoa Rodríguez, Dr Ned Ekins-Daukes, Alvin Chan and Stefan Pfenninger)

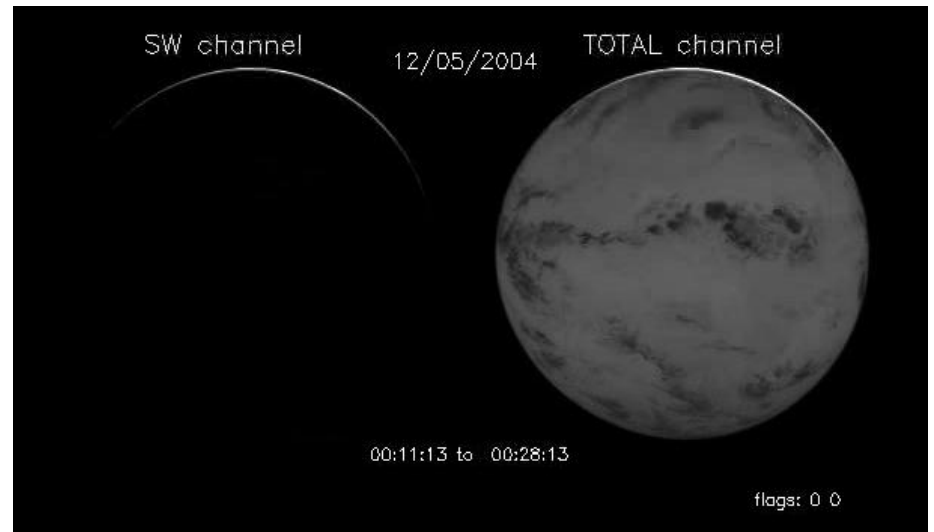
## Space and Atmospheric Physics

### EO for climate applications

- (i) Observing the variability in the Earth's outgoing energy at high time resolution from the Geostationary Earth Radiation Budget instrument (GERB): the world's **only** ERB instrument in geostationary orbit...



Earth Observation Calibration Facility

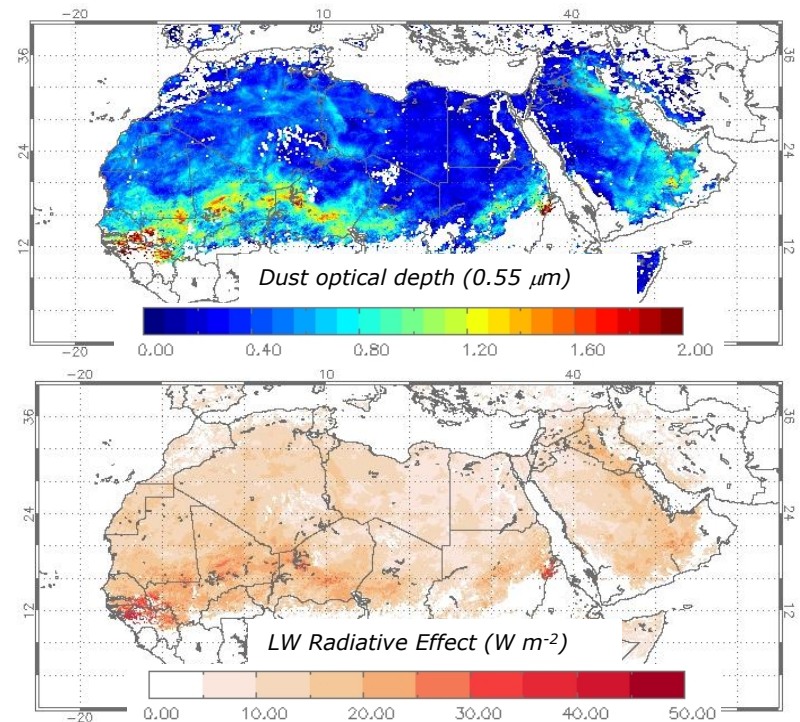
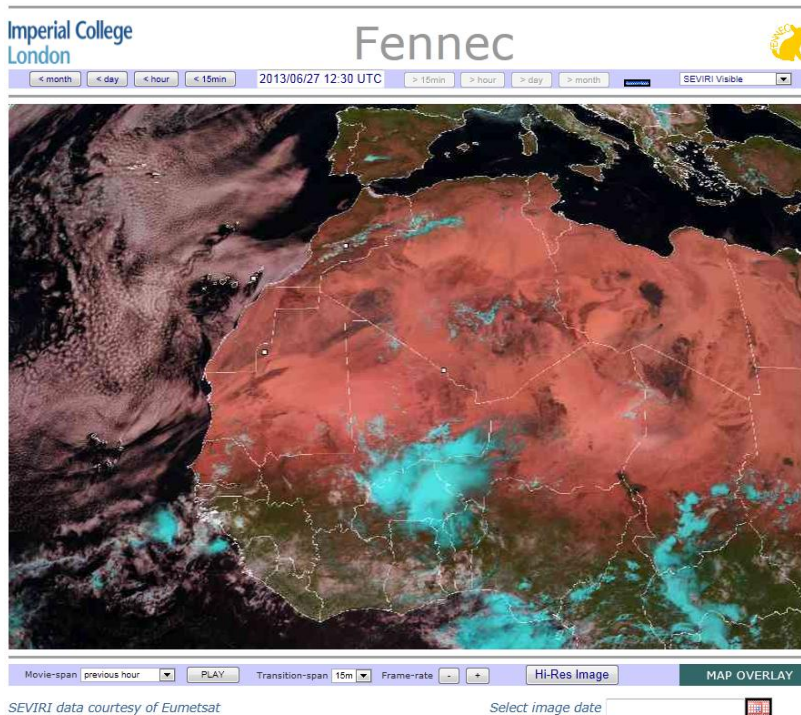


One day of Level 1.5 GERB data

# Space and Atmospheric Physics

## EO for climate applications

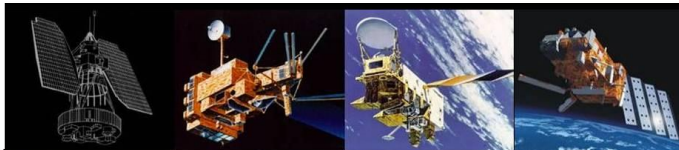
- (i) ... and using co-located observations from the SEVIRI narrow-band radiometer to diagnose the atmospheric parameters causing the variability seen.



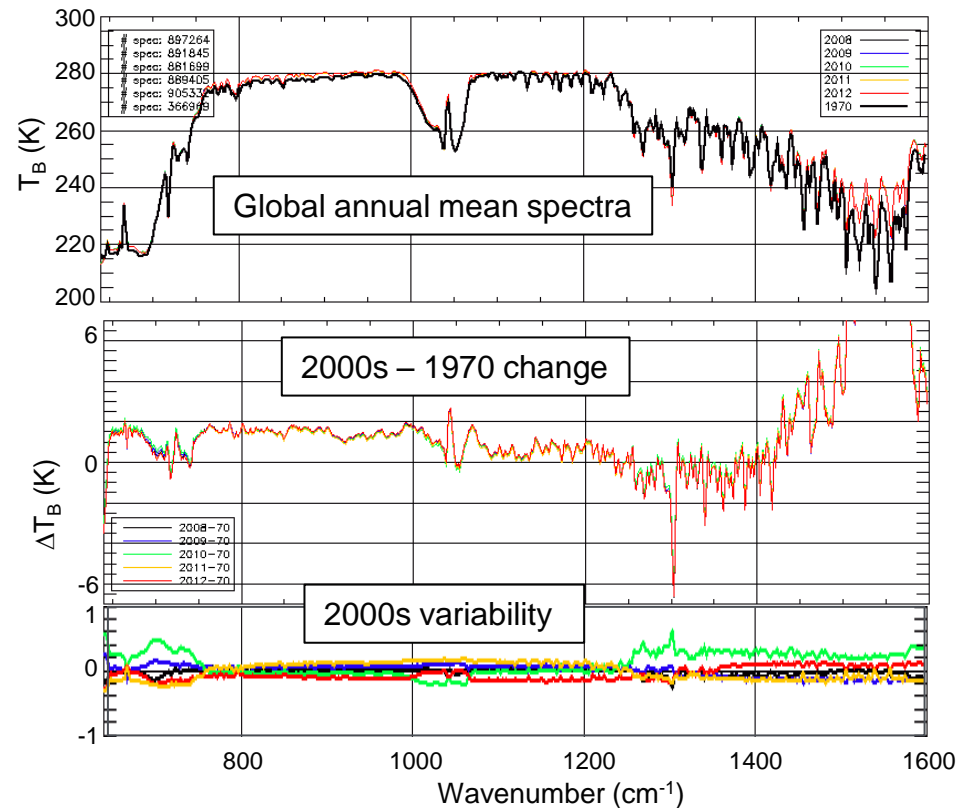
# Space and Atmospheric Physics

## EO for climate applications

(ii) Investigating drivers of climate variability and change: Spectral signatures



Instrument	IRIS	IMG	AIRS	IASI
Satellite	Nimbus 4	ADEOS	AQUA	METOP-A
Spectro-meter type	FTS	FTS	grating spectrometer	FTS
Data available	Apr 1970 – Jan 1971	Oct 1996 – Jun 1997	2002 - present	2007 - present
Spectral coverage (cm <sup>-1</sup> )	400 – 1600 cm <sup>-1</sup> continuous	715 – 3030 cm <sup>-1</sup> 3 bands	650 – 2700 cm <sup>-1</sup> 2378 bands	645 – 2760 cm <sup>-1</sup> 3 bands
Spectral resolution	2.8 cm <sup>-1</sup>	0.1 cm <sup>-1</sup>	0.4–1.0 cm <sup>-1</sup>	0.5 cm <sup>-1</sup>
Footprint (nadir)	95 km diameter	8km x 8km	13 km diameter	12 km diameter



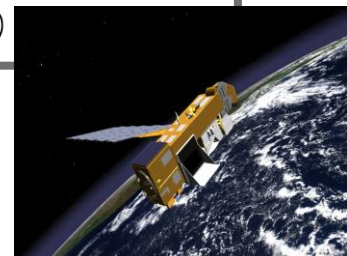
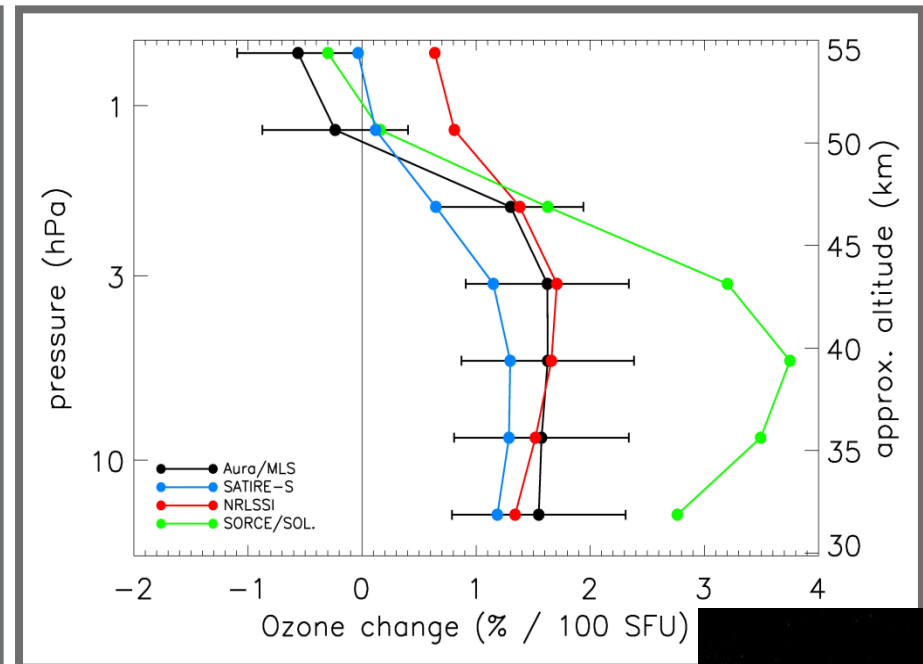
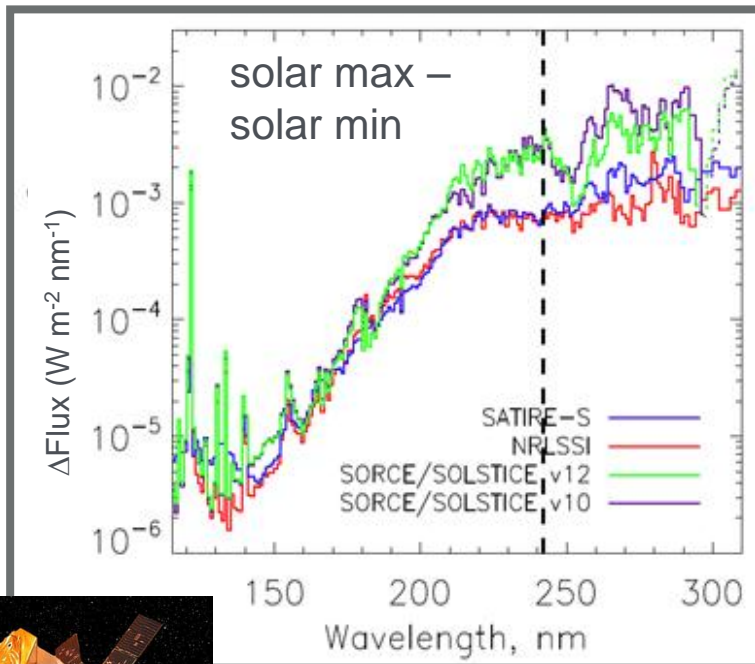
*In support of CLARREO and TRUTHS*



# Space and Atmospheric Physics and Astrophysics

## EO for climate applications

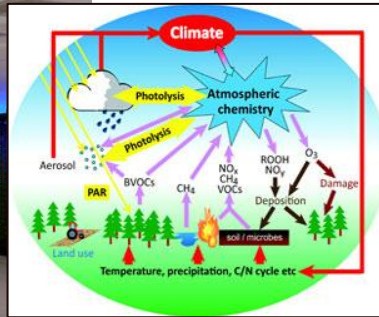
(ii) Investigating drivers of climate variability and change: Solar activity and ozone



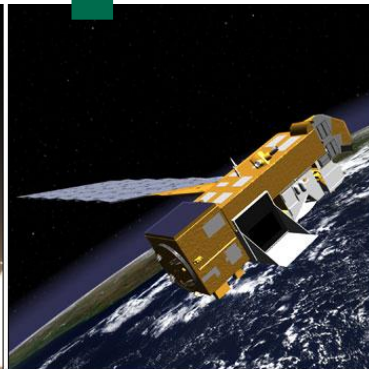
# Space and Atmospheric Physics

## EO for climate applications

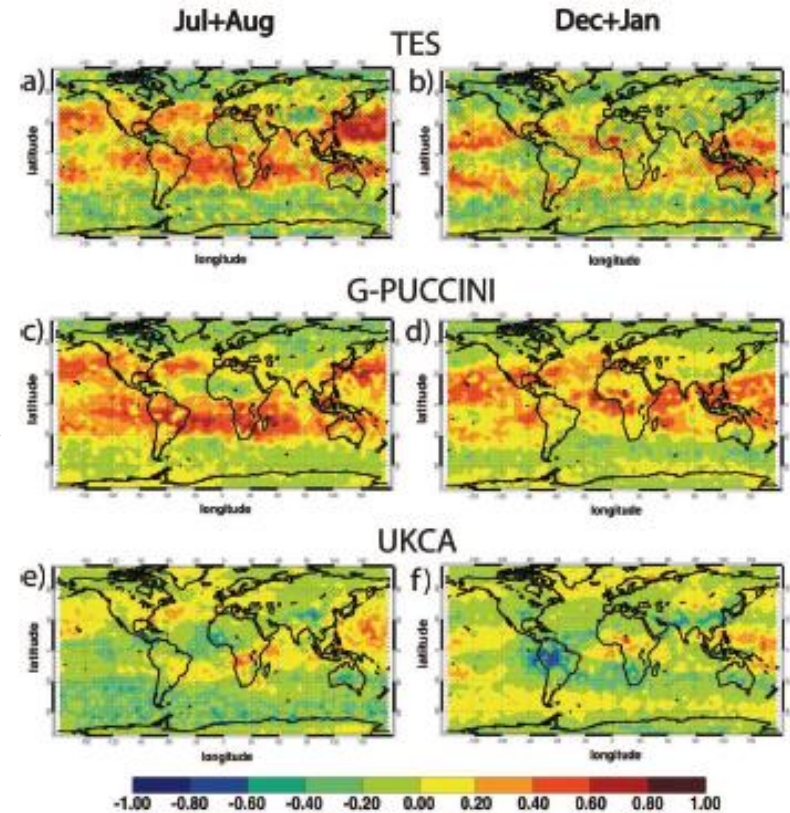
(iii) Improving our understanding of Earth System processes



Boeing Delta II Rocket



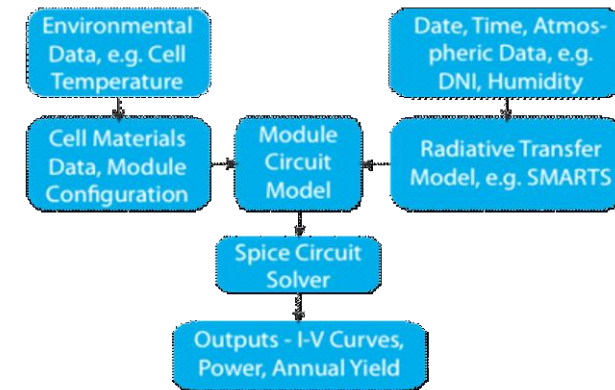
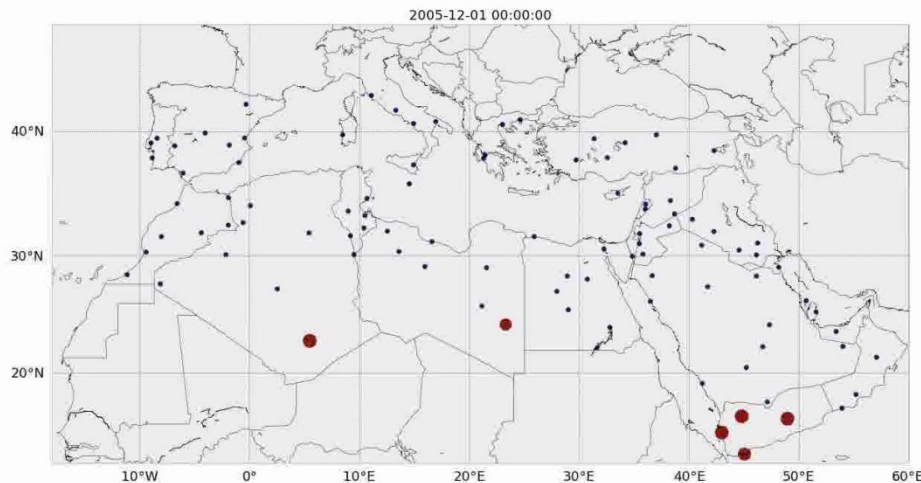
Artist's rendering of Aura in Orbit



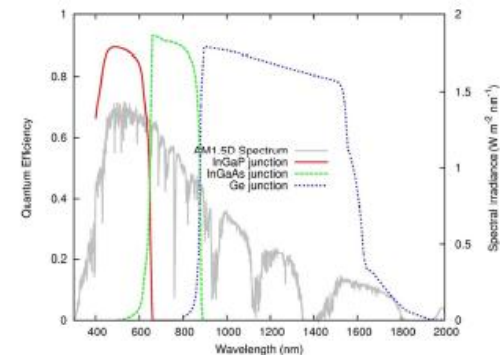
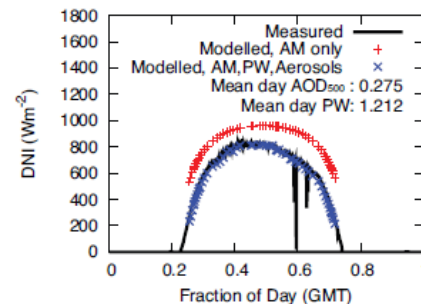
# Civil and Environmental Engineering, Experimental Solid State Physics and Space and Atmospheric Physics

## EO for green technology

Using EO products to assess likely energy yield and to optimise solar cell design



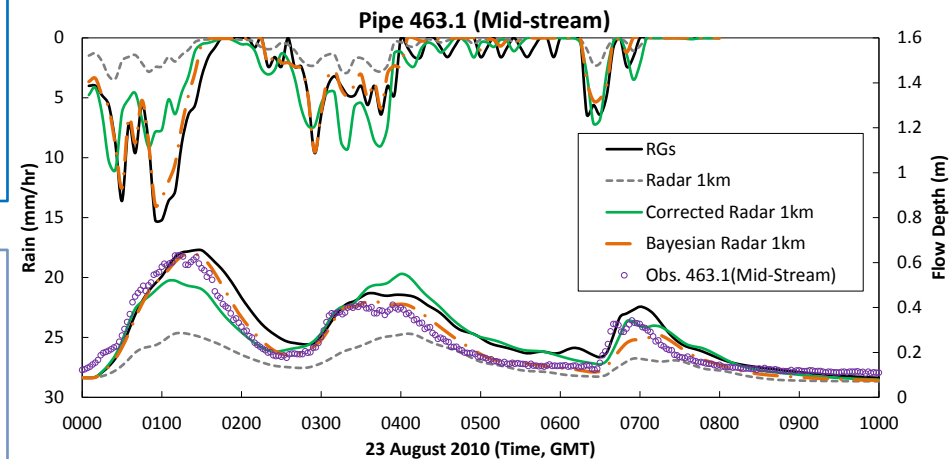
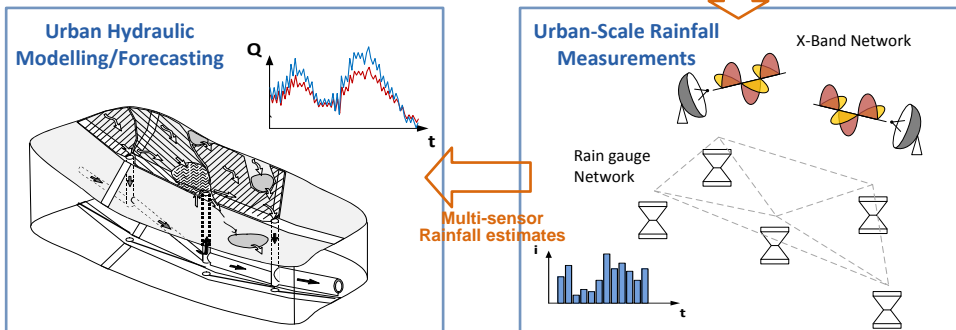
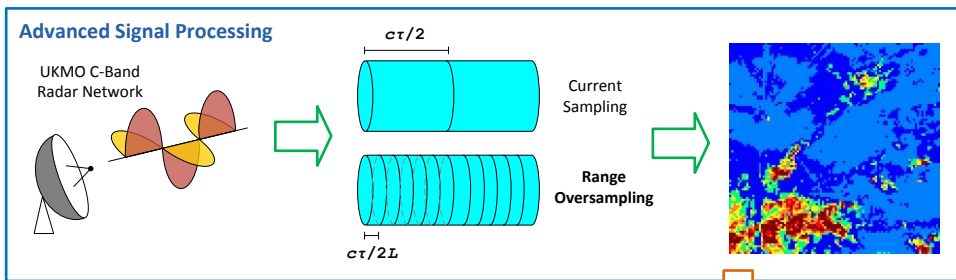
Simulated output from CSP + thermal storage plants through one day in 2005



# Civil and Environmental Engineering

## EO for Water Resource Management (Urban Water Resources Group)

Improving operational radar rainfall estimates for use in urban hydrology (e.g. storm-water drainage modelling, surface water flood prediction etc.)



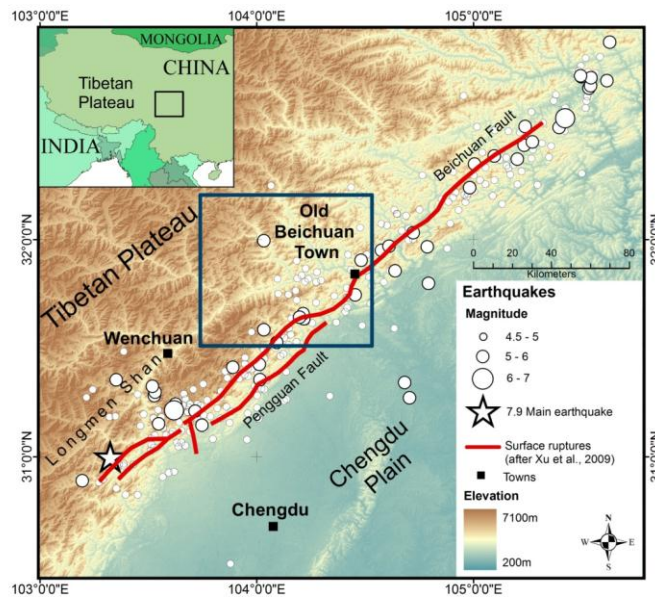
Methodology can also incorporate satellite radar observations



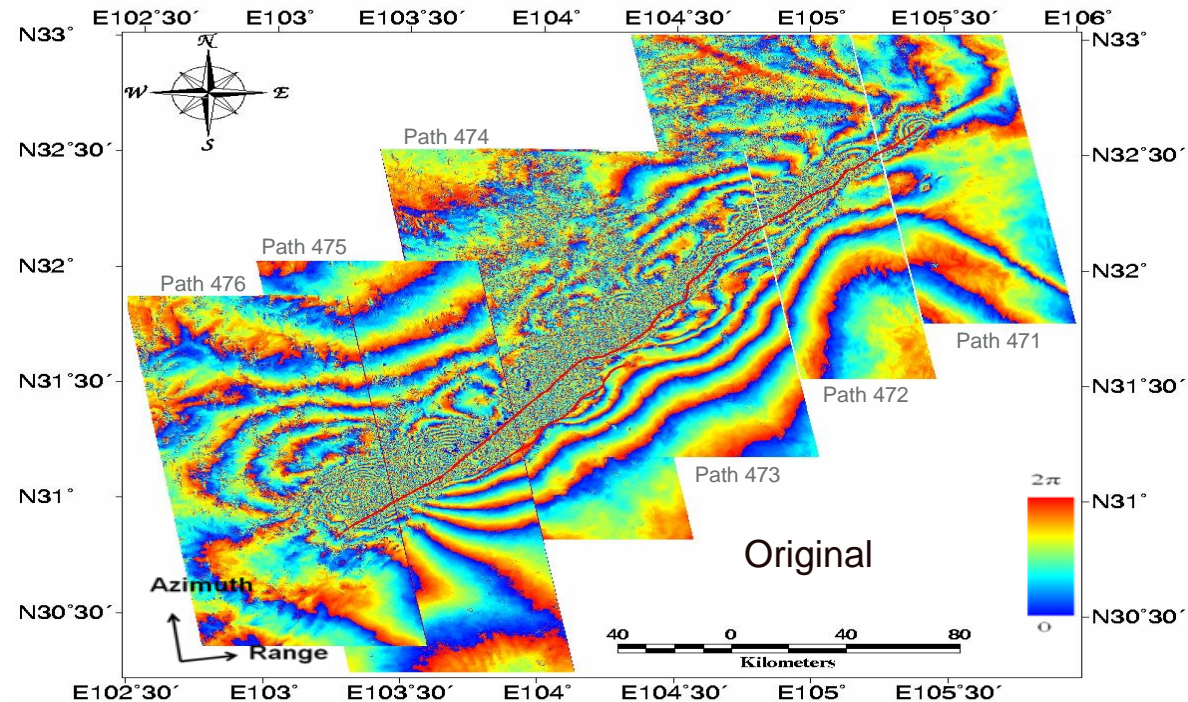
# Earth Science and Engineering

## EO for geohazard assessment

Improving the information content of DInSAR imagery within earthquake fault zones



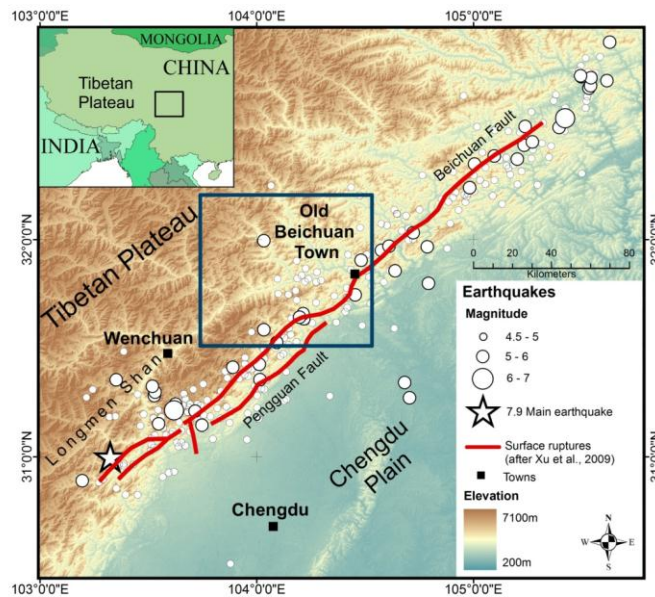
Wenchuan earthquake, Sichuan Province, China (12<sup>th</sup> May 2008)



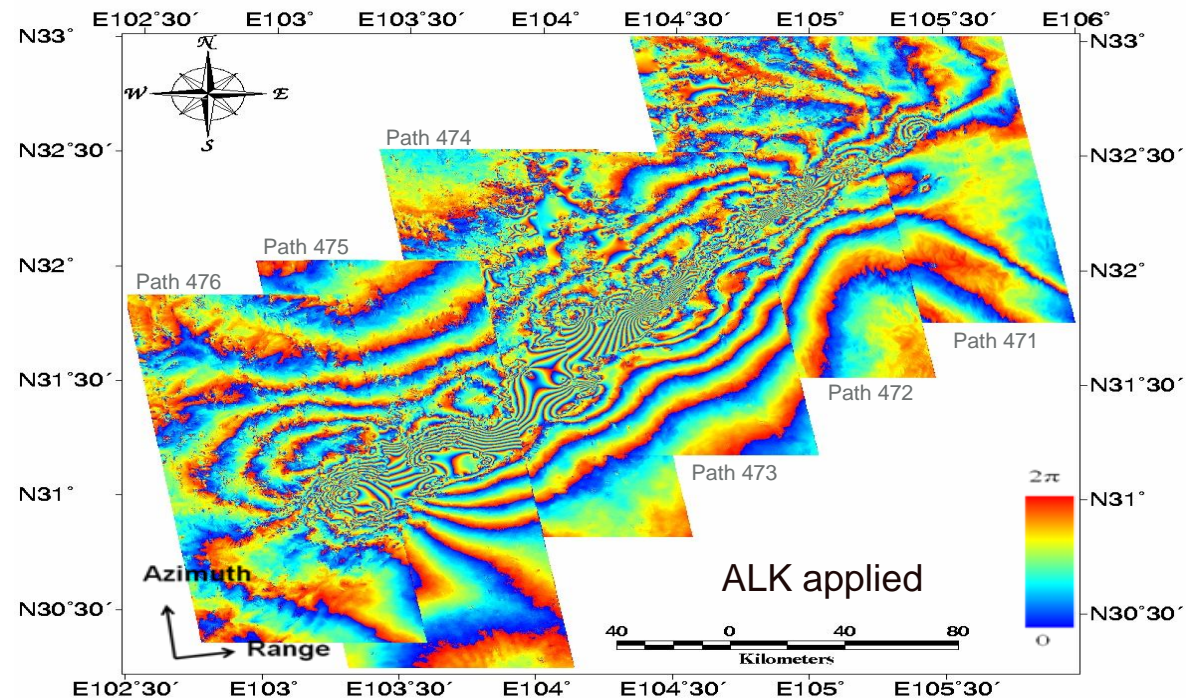
# Earth Science and Engineering

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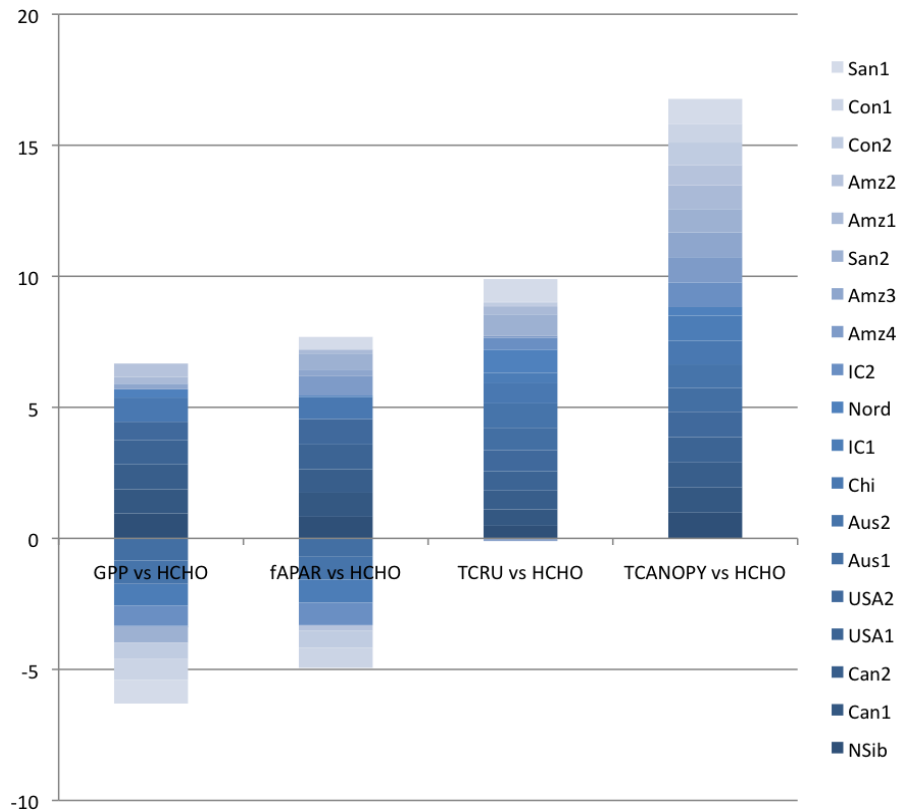
Wenchuan earthquake, Sichuan Province, China (12<sup>th</sup> May 2008)



# Ecology and Evolution

## EO for understanding and modelling of the terrestrial biosphere

Using satellite products to investigate controls on emissions of biological volatile compounds



Stacked correlation between seasonal variation in remotely sensed column formaldehyde (HCHO) and selected vegetation parameters at selected worldwide locations

