

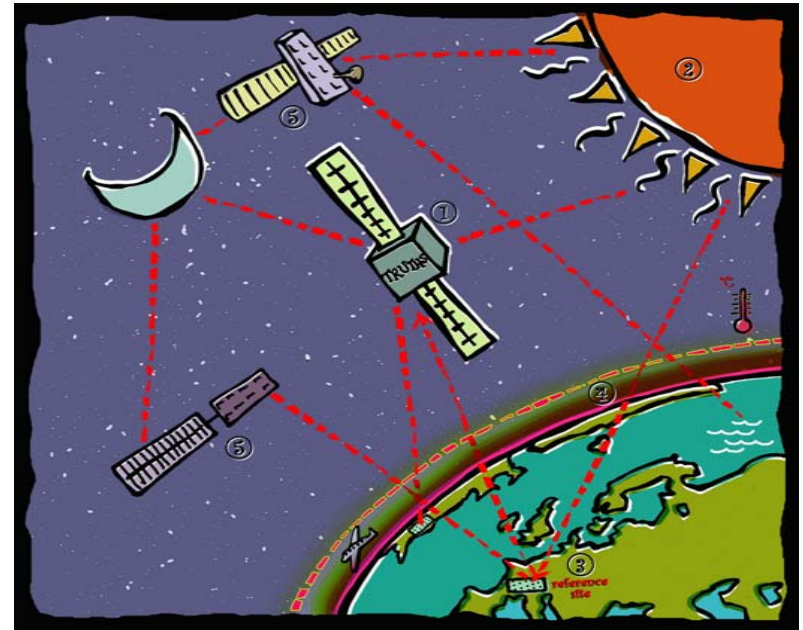
# Benchmark missions to meet the needs of climate and “operational” Cal/Val (CLARREO & TRUTHS) (DA-09-01a-5)

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# GEO actions:

- **NASA to initiate dialogue with UK/ES relating to collaboration and coordination of the benchmark measurement/calibration missions (TRUTHS and CLARREO)**
- **Subject to resourcing an optimisation study will be carried out to define operational and detailed mission/instrument specifications of TRUTHS to establish “strawman” requirements as a basis for identification and collaboration of other CEOS space agencies**

# CEOS Climate action A5 (responding to GCOS) now part of GEO task 09-01a

*2006/07*

*CEOS will plan by 2011 to make absolute, spectrally resolved measurements of radiance emitted and reflected by the Earth to space for information on variations in both climate forcings and responses.*

**Mitch Goldberg – GSICS proposed similar need for “benchmark measurements” from space to serve as reference for operational satellites**

2002: NPL led a team (largely from CEOS IVOS) submitting a proposal TRUTHS (Traceable Radiometry Underpinning Terrestrial- and Helio-Studies)

to open ESA call:

- Benchmark mission to provide SI traceable measurements of incoming solar irradiances (total and spectrally resolved and reflected spectral radiances (0.01 to ~ 0.3% respectively)
- Transferring its in-flight calibration accuracy to other sensors via calibrating a set of ground targets and the moon

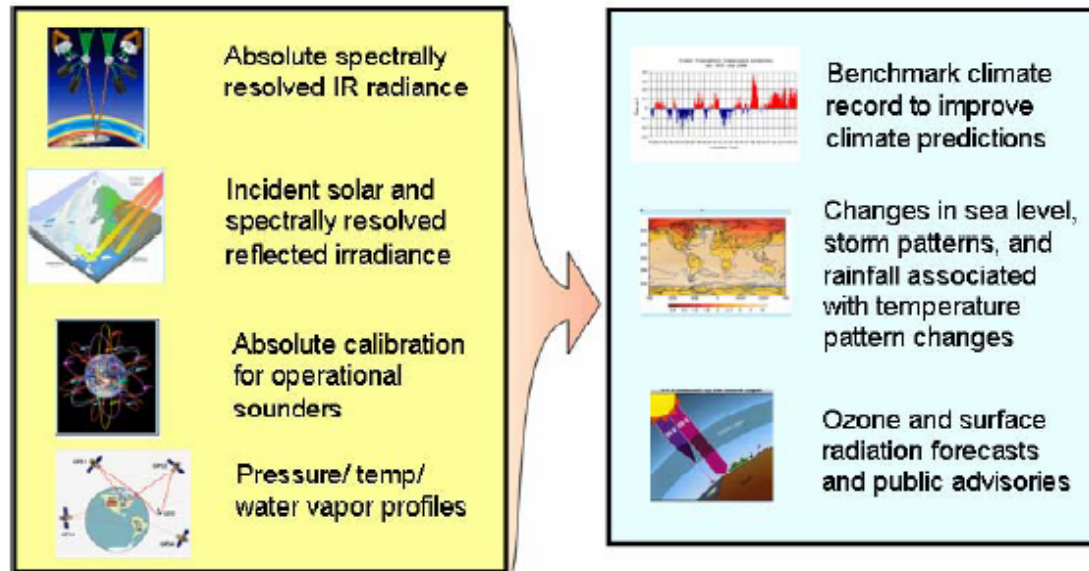
# NRC decadal survey 2007: CLARREO

## Climate Absolute Radiance and Refractivity Observatory (CLARREO)

Climate Absolute Radiance and Refractivity Observatory  
(CLARREO)

Launch: 2010-2013

Mission Size: Small



- One of four missions under consideration by NASA
- Traceability to SI in orbit is key *avoids high risk strategy needing data overlaps and instrument degradation*
- Operationally can provide calibrations to other dedicated EO missions
- Workshop July 2007 detailed requirements and options
  - Ideally 3 satellites (2 for IR, 1 solar reflective)
  - International collaboration to implement
  - TRUTHS identified as able to provide solution for solar band

Earth Science and Applications from Space: National Imperatives for the Next Decade and Beyond

<http://www.nap.edu/catalog/11820.html>

[http://map.nasa.gov/clarreo\\_materials.html](http://map.nasa.gov/clarreo_materials.html)

# Requirements

## Climate Need: IGOS, ASIC<sup>3</sup>

	Accuracy/stability (over 10 yrs)
– Total solar Irradiance	<0.02 %
– Solar spectral Irradiance	<0.1 %
– Earth reflected spectral radiance (380-2400 nm)	<0.5 %
- Emitted (brightness temp) to ~100 $\mu\text{m}$	0.1 K

Environmental monitoring .... Reliability, indisputable, sensitivity, detectability

- LSI constellation <~1%
- GMES sentinels (climate quality)

**Only reliable (low risk) solution is to establish robust traceability to international agreed standards “SI units” in common with other terrestrial applications but must have traceability “in flight”**

Facilitate QA4EO – testsite calibration

AATSR serves as benchmark for SST

# Status of CLARREO & TRUTHS

## CLARREO

- **Baseline concept is for IR to be global sampling, solar reflective to be targeted sampling and cross-calibration**
- **Mission development studies managed by Dave Young NASA Langley**
  - **Mission optimisation: spectral, orbits, intercomparison strategy, sampling**
  - **Concept development: FTIR, blackbodies, (concentrating on IR domain)**
- **Science and progress review held May 2009**
- **New programme manager: Richard Slonaker**
- **Looking to complete pre-phase A Dec 09 and then move to Phase A/B**

## TRUTHS

- **Baseline concept exists**
- **Primary standard (cryogenic radiometer) under design/engineering model build (NPL (UK) and WRC (CH) (testing in 2009/10)**
- **Promoting concept (seeking resource to optimise and launch)**
- **NASA have drafted MOU to NERC/BNSC seeking formal Collaboration on pre-phase A studies will be signed shortly**
- **RESOURCE in UK is difficult although various options still being pursued**

# GEO actions:

- **NASA to initiate dialogue with UK/ES relating to collaboration and coordination of the benchmark measurement/calibration missions (TRUTHS and CLARREO)**

**DONE**

- **Subject to resourcing an optimisation study will be carried out to define operational and detailed mission/instrument specifications of TRUTHS to establish “strawman” requirements as a basis for identification and collaboration of other CEOS space agencies**

**Awaiting resource**