

Policy Documents that address the science goals of CLARREO and TRUTHS

1) US Earth Science Decadal Survey

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

Authoring Organization: United States National Research Council

Web access:

http://www.nap.edu/catalog.php?record_id=11820

Date: January 2007

Quotes:

“CLARREO addresses three key societal objectives: (1) provision of a benchmark climate record that is global, accurate in perpetuity, tested against independent strategies that reveal systematic errors, and pinned to international standards; (2) development of a trusted, tested operational climate forecast through a disciplined strategy using state-of-the-art observations with mathematically rigorous techniques to establish credibility; and (3) disciplined decision structures that assimilate accurate data and forecasts into intelligible and specific products that promote international commerce and societal stability and security.”

2) NASA Climate Planning Document

Title: *Responding to the Challenge of Climate and Environmental Change: NASA's Plan for a Climate-Centric Architecture for Earth Observations and Applications from Space*

Authoring Organization: NASA

Web access:

http://science.nasa.gov/media/medialibrary/2010/07/01/Climate_Architecture_Final.pdf

Date: June 2010

Quotes:

“The CLARREO mission is designed to monitor and understand changes in the climate system, and many of the important feedback mechanisms, in unique ways that ensure well-validated traceability to absolute SI-calibrated physical standards.”

“The budget request will enable improvements to our national calibration and inter-calibration capability that will allow NASA to work more closely with its international and domestic partners to assure the consistency of data across platforms and the traceability of data to recognized standards.”

“With the President's FY2011 budget request NASA will accelerate the development of a scientifically viable, cost constrained mission with the first launch in 2017, and the second in 2020.”

3) WMO / BIPM Workshop Recommendations

Title: *Report on the WMO- BIPM workshop on Measurement Challenges for Global Observation Systems for Climate Change Monitoring: Traceability, Stability and Uncertainty 30 March to 1 April 2010 (draft)*

Authoring Organization: World Meteorological Organization / Bureau international des poids et mesures

Web access:

<http://www.bipm.org/utils/common/pdf/rapportBIPM/2010/08.pdf>

Date: 2010

Quotes:

“The temperature of the Earth responds to changes in the radiative energy balance maintained between the incoming solar radiation and the outgoing reflected solar radiation and emitted thermal radiation. Accurate total and spectral space and surface measurements of these radiation components at various spatial and temporal scales are critical for understanding the long-term trends in the Earth’s climate. Moreover, these measurements must be tied to the SI to ensure their comparability independent of time, locale, or sensor. The measurement problem is extremely challenging since the accuracy required is commensurate with the state of the art for spectral radiance and irradiance measurements performed in environmentally controlled laboratories at National Metrology Institutes.”

4) Inter-Agency Calibration Recommendations

Title: *Achieving Satellite Instrument Calibration for Climate Change (ASIC3)*

Authoring Organization: NOAA, NIST, NASA, NPOESS, SDL

Web access:

<http://www.star.nesdis.noaa.gov/star/documents/ASIC3-071218-webversfinal.pdf>

Date: 2006

Quotes:

“Overarching recommendation 1: Conduct a set of satellite benchmark missions to create irrefutable records and calibrate other satellite sensors”

“Achievement of high accuracy, global climate records from Earth orbit introduces two unique aspects to the metrology of the endeavor. First, the instruments employed on the satellite to obtain the climate observations cannot be recovered such that biases against an SI traceable standard in the laboratory can be established. Second, and as a result, SI traceability on-orbit is required to establish a climate record that is tested and trusted.”

5) Global Climate Observing System Plan

Title: *Implementation Plan for the Global Observing System for Climate in Support of the UNFCCC (2010 Update)*

Authoring Organization: Global Climate Observing System (GCOS)
Secretariat

Web access:

http://www.ceos.org/images/wgcv/gcos/GCOSIP-10_DRAFTv1.0_131109.pdf

Date: 2010

Quotes:

Action A-18: Implement and evaluate a satellite climate calibration mission

“Satellite radiances provide measurements of several global atmospheric upper air variables, temperature and water vapor in particular. However they can be subject to biases from uncertainties in the sensor calibration and data pre-processing (e.g. cloud removal). The Climate Absolute Radiance and Refractivity Observatory (CLARREO) Mission has been proposed as a key component of the future climate

observing system providing an absolute calibration traceable to SI standards. It will underfly the satellites used for climate monitoring and will serve as a tool for satellite intercalibration to provide a climate benchmark radiance dataset. One component of CLARREO involves the measurement of spectrally resolved thermal infrared and reflected solar radiation at high absolute accuracy. Coupled with measurements from on-board GPS radio occultation receivers, this will provide a long-term benchmarking data record for the detection, projection, and attribution of changes in the climate system. It will also provide a source of absolute calibration for a wide range of visible and infrared Earth observing sensors, increasing their value for climate monitoring.”

6) **Global Spacebased Inter-Calibration System (GSICS)**

Title: *Implementation Plan for a Global Space-Based Inter-Calibration System (GSICS)*

Authoring Organization: World Meteorological Organization (WMO)
Coordination Group for Meteorological Satellites

Web access:

http://www.wmo.int/pages/prog/sat/GSICS/documents/GSICS_IP.pdf

Date: April 2006

Quotes:

“Benchmark observations are very high quality measurements that serve as the gold standard for measuring a particular variable and that could be applied to calibrating other observations of the same variable. “

“GSICS will also champion long-term continuity of measurements of these instruments, as well as the development and launch of absolutely calibrated, spectrally-resolved radiance instruments to measure radiance emitted and reflected by the Earth. These latter instruments, obtaining benchmark measurements of the complete emitted and reflected spectrum of the Earth would be ideal for calibrating any passive operational radiometer or spectrometer.”

7) **Report by the Committee on Climate Change**

Title: *How well prepared is the UK for climate change?*

Authorizing Organization: Adaptation Subcommittee

Web access:

http://downloads.theccc.org.uk.s3.amazonaws.com/ASC/CCC_ASC_Report_web_1.pdf

Date: September 2010

Quotes:

Section 2.3 The challenges of measuring success Monitoring and evaluating successful adaptation is a challenge for several reasons: Uncertainty about future climate. The UK’s adaptation strategy will have to anticipate a range of future climates. While there is overwhelming evidence that the world is warming and will continue to warm further, there are uncertainties surrounding the scale, timing and nature of how the climate might change. These arise in part from uncertainty in future emissions and in part from the chaotic nature in which the climate system behaves, which becomes increasingly more unpredictable at the regional level. Uncertainty also arises because climate models cannot simulate the real world with complete accuracy. These uncertainties make it difficult to know what future climate to adapt to.

(Note: CLARREO offers a mechanism by which the climate model predictions can be tested and then improved.)

8) Report by the Space IGS

Title: *A UK Space Innovation and Growth Strategy (2010-2030)*

Authorizing Organization: Minister for Science and Innovation

Web access:

http://www.spaceigs.co.uk/documents/index/index/cPath/14_24/

Date: 2010

Quotes:

Recommendation 6 - Climate change is undoubtedly one of the greatest challenges facing mankind for generations to come, and there is an urgent need for the UK government to join international efforts in validation, mitigation and adaptation. An early priority is to regain public confidence in the scientific evidence for action through the gathering of independent, incontrovertible evidence of the changes in climate.

9) Report by the Space BNSC

Title: *UK Civil Space Strategy (2008-2012 and beyond)*

Authorizing Organization: British National Space Centre

Web access:

<http://www.bnsc.gov.uk/assets/channels/about/ukcss0812.pdf>

Date: February 2008

Quotes:

The vision - Managing our changing planet: Within the UK, the BNSC partner organization the Natural Environment Research Council (NERC) is the lead agency responsible for developing new techniques for exploiting Earth observation data, satellite instrumentation and for training specialists. Unraveling the interactions and feedbacks of the environment and climate systems is a central plank of its strategy 'Next Generation Science for Planet Earth'. Space systems have a key role to play in overcoming the historical difficulty of obtaining accurate, synoptic, continuous, and simultaneous measurements of the Earth's atmosphere, oceans, ice sheets, land surface and interior. The UK will continue to use ESA as its primary means of procuring new Earth science missions, but may pursue selected niche opportunities on a bilateral basis with other partners where appropriate. Strong engagement will continue with the key relevant international programs and initiatives, including the Group on Earth Observations (GEO) and the Committee on Earth Observation Satellites (CEOS) which bring together international partners.