

Study for new satellite mission underway to make more accurate predictions of climate change

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The National Physical Laboratory (NPL) is leading a project seeking to launch a satellite which will provide more accurate climate data, improving our understanding of the impact of climate change.

The Earth's climate is undoubtedly changing, but the speed and implications are unclear. Our most reliable models rely on data acquired through challenging measurements. Most of the key measurements must be taken from space over long periods so that the small signal change becomes large enough to detect from the background of natural variability. This presents problems as measurement instruments drift over time and the 'time to detect' directly depends on accuracy. Estimates of [global temperature](#) increases by 2100, range from ~2 degrees C and with this uncertainty it makes is difficult for policy makers to establish priorities for adaptation and mitigation.

The proposed TRUTHS (Traceable Radiometry Underpinning Terrestrial- and Helio- Studies) mission would see a satellite launched into orbit with the ability to make very high accuracy 'gold standard' measurements and also calibrate and upgrade the performance of other Earth Observation satellites in space.

It would do this by establishing fully traceable benchmarks of essential climate variables and parameters with sufficient accuracy to facilitate decadal climate change detection, both directly from its own

measurements and through upgrading the performance of other Earth Observation (EO) satellites currently in orbit through 'reference calibration'.

The full proposed mission (and its US sister CLARREO) has not yet managed to secure flight-funding despite huge interest from the world's space agencies and climate science community. The UK [Space Agency](#) (UKSA), through its Centre for Earth Observation Instrumentation (CEOI), has now stepped in to fund a study to optimise the scientific scope of the mission to facilitate the potential of a minimised technical implementation, whilst maintaining its key objectives as far as possible – a trimmed down version of TRUTHS, or 'TRUTHS-Lite' was born.

NPL with partners from Imperial College London, Rutherford Appleton Laboratory and Surrey Satellite Technology Ltd have now started work on the study.

The hope is that, following this study, in addition to a more refined set of requirements for a full TRUTHS mission, a lower cost/rapid development demonstrator, 'TRUTHS-Lite' mission, could attract funding and be launched as early as 2016. This would not only provide some of the necessary baseline measurements for climate in a timescale commensurate with the urgency demanded, but also serve as a showcase for the UK commercial space sector - a sector identified as exhibiting the hallmarks of sustainable, high value growth needed by the UK economy. Such a mission could be a flagship to underpin UK ambitions in climate services and initiatives like the 'space catapult' of TSB and the International Space and Innovation Centre (ISIC).

'TRUTHS-Lite' would still deliver measurements with full traceability to SI units and the same high accuracies in orbit as proposed for the full mission, but for a limited range of parameters and shorter duration. The most likely configuration would be: Total Solar Irradiance and Earth

reflected radiances limited to the 400 to 1000 nm (silicon) spectral range.

Such a payload would make a major contribution to [climate science](#), enabling an understanding of key 'feedback' mechanisms such as clouds, albedo and aerosols and the potential to underpin key essential climate variables (ECVs) related to the Earth's radiation budget and the carbon cycle (land cover, ocean colour, forest carbon, etc.). A key feature is that it will also be able to demonstrate how well it can upgrade the performance of other satellites' sensors through reference calibration.

Dr Nigel Fox, who is leading the study said: "The National Physical Laboratory is delighted that this TRUTHS study has been given the go-ahead from the CEOI. It provides the opportunity to scope a [mission](#) which can be implemented quickly, demonstrate UK innovation and help in staking the claim for the UK to be recognised as the international hub underpinning and supplying the much needed 'trustable' high quality data needed for improved climate forecasting and development of new [climate](#) services."

Provided by National Physical Laboratory

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