Traceability of Measurements and the International Metrology Framework

GRUAN Implementation Meeting

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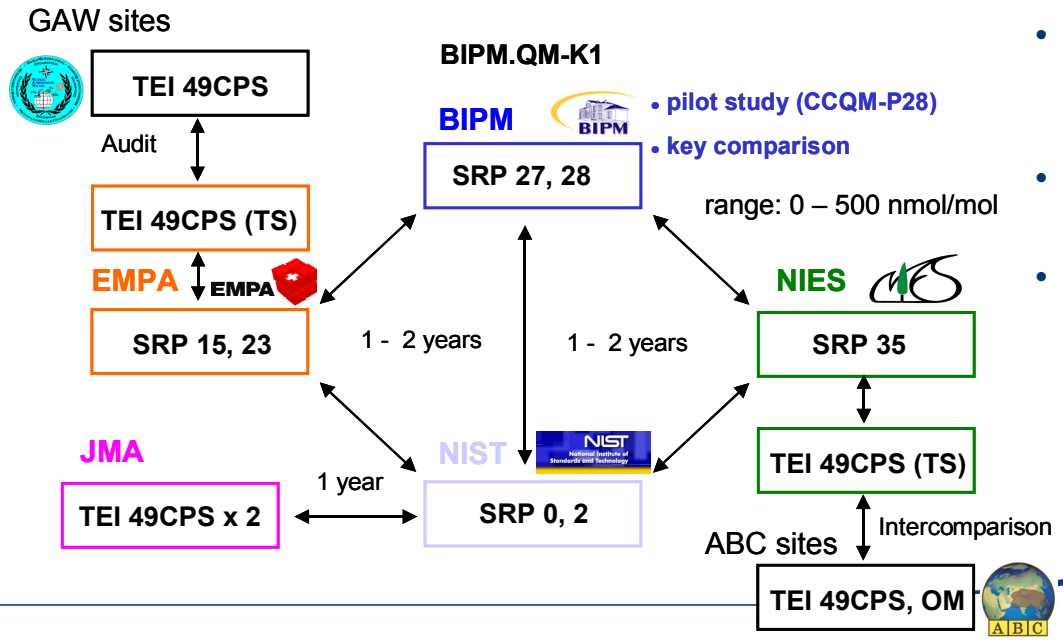
International Metrology Framework

- National Measurement Institutes (NPL, PTB, NIST, etc.) provide national support for metrology – initially for industrial measurement, but increasingly for 'quality of life' measurements (health, environment, ergonomics).
- NMI's also provide international comparability/traceability for measurements under the auspices of the BIPM (International Bureau for Weights and Measures).
- Metrological Traceability : property of a measurement result whereby the result can be related to a stated reference through a documented unbroken chain of calibrations, each contributing to the measurement uncertainty (VIM 2006).
- BIPM and WMO are planning a joint workshop on 'Metrology for Climate Change Monitoring'.



- **National and international networks for atmospheric ozone measurements**
- Joint BIPM-NIST programme to maintain the comparability of the worldwide network of ozone reference standards
- Key comparison exercises to determine the equivalence of ozone reference standards.
- All results publicly available : http://www.bipm.org/en/scientific/chem/gas_metrology/ozone_comparisons.html

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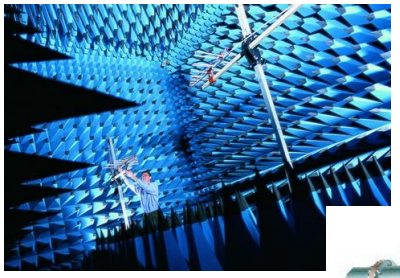
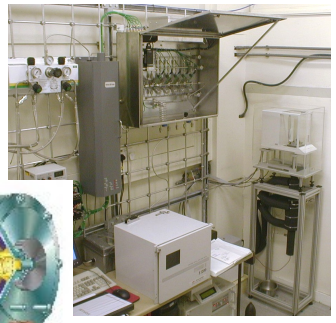
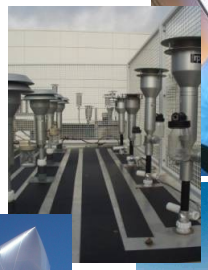
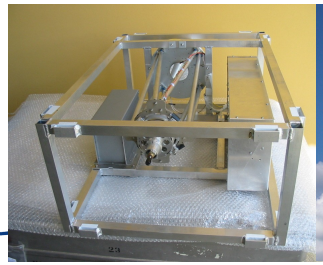
Activities at NPL

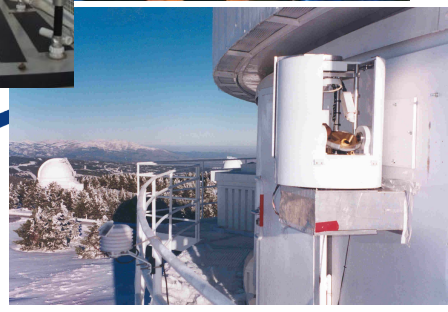
- **Temperature** – new acoustic resonance thermometer (sub-mK absolute accuracy)
- **Humidity** calibration range from +90(+/-0.2)°C to –97 (+/-0.5)°C dew/frost point.
- **Radiative Calibration** – new cryogenic radiometer as World Radiation Reference.
- Satellite **optics/detector characterisation** (GOME, MODIS, GERB)
- **Microwave** – antenna calibration (20 Hz to 110 GHz), power flux density and specific absorption rate measurements.
- **Gas Standards** – gravimetric and active preparation methods for single and multi-component VOC, CO, CO_2, SO_2, etc. Micro-cylinders for in-situ calibration.
- QA/QC of **Air Quality Networks**.
- **Differential Absorption Lidar** (IR and UV).
- Balloon- and aircraft-borne **laser spectrometers**
- **Solar FTIR** with radiometric calibration (water-vapour continuum)
- **Instrument validation** – open path optical, environmental / industrial conditions.
- **Particle measurements** / validation – mass, speciation, size distribution.
- Mathematical / statistical **uncertainty studies**.

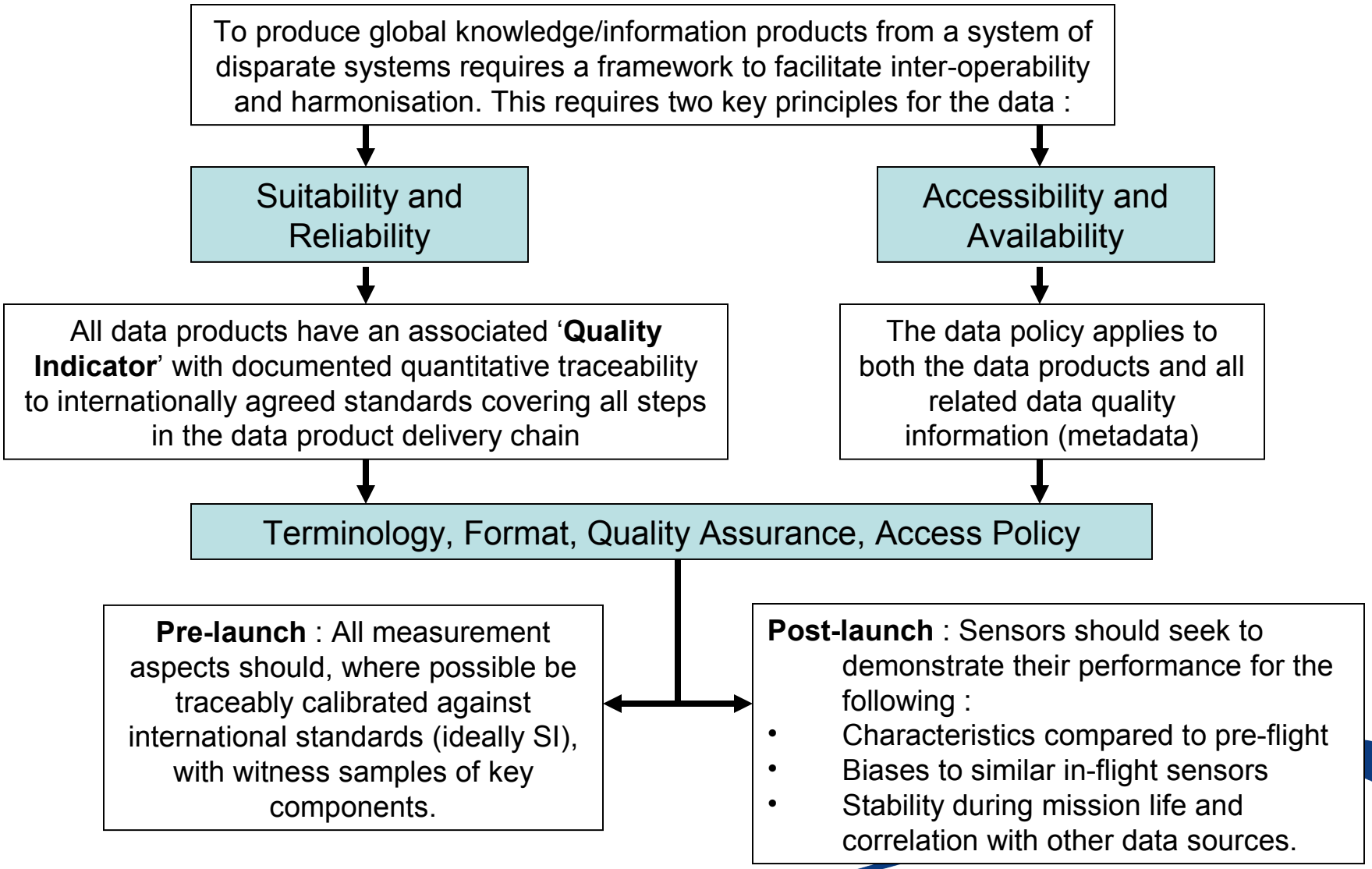






CEOS Knowledge/Information Product



Specific Issues

- Is GRUAN an operational network, or a research network ?
- Who is customer and what data delivery time is required? What time is available for data QA ?
- Will primary outputs be individual instrument data sets or a series of ‘GRUAN columns’ ?
- How will GRUAN activities feed down the doughnuts (traceability pyramid) ?
- Some form of regular intercomparison required for long-term stability – should this involve intercomparison campaigns (multiple teams at single location) or ‘travelling standard’ ?