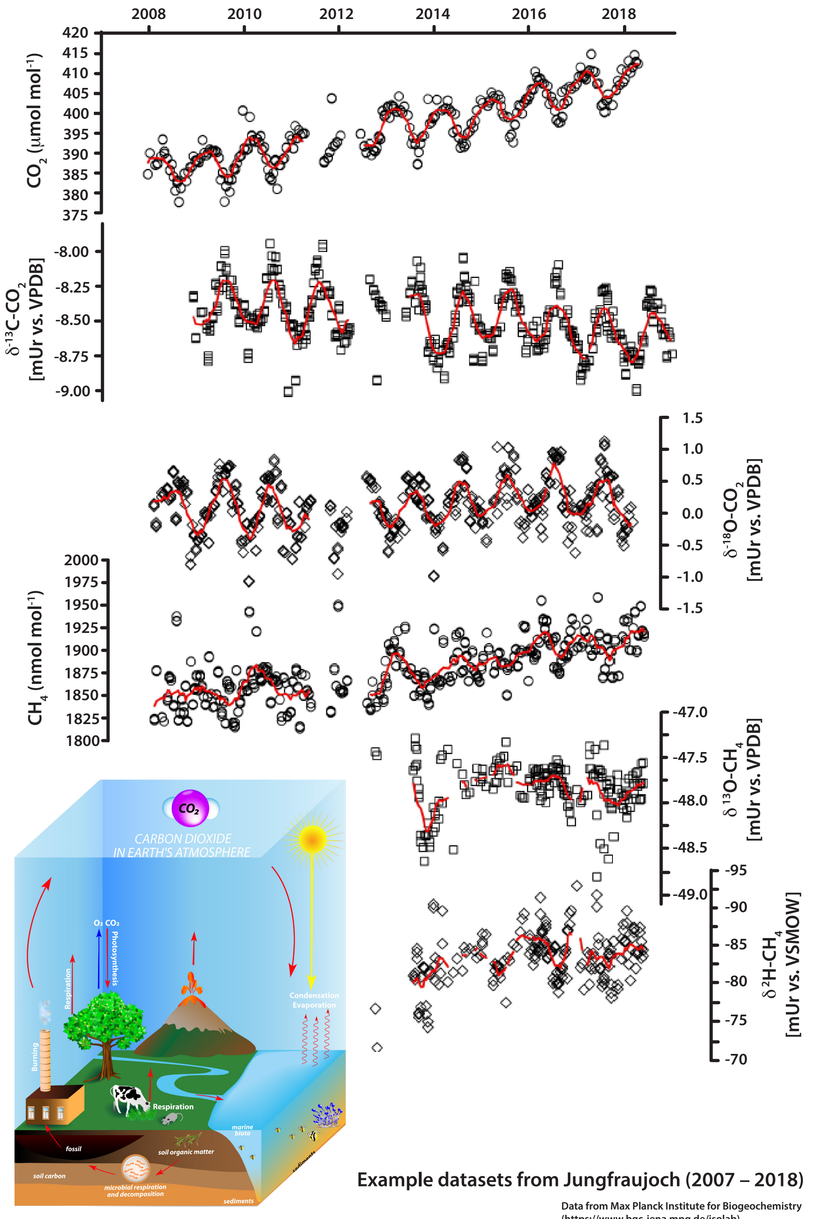
JRP-v02

STELLAR: Stable Isotope Metrology to Enable Climate Action and Regulation

Need

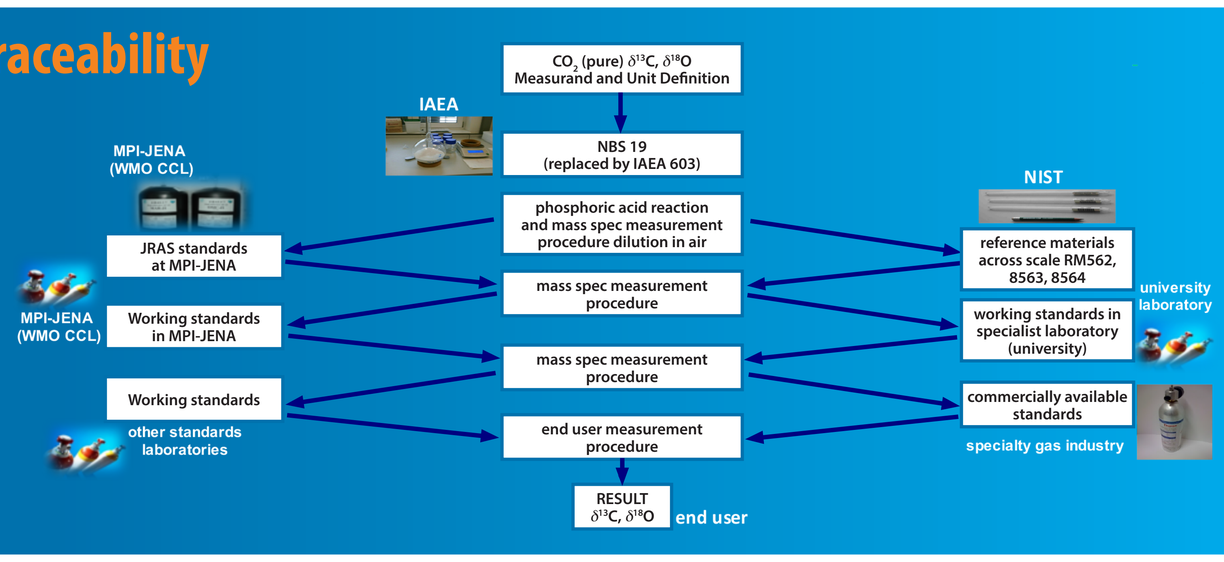
- Climate change is one of the greatest risks to society worldwide (CO_2 and CH_4 are major contributors)
- To support governments to verify emissions and demonstrate national reduction targets we need to discriminate between the natural and various manmade sources of greenhouse gases
- Requires information on the isotopic composition
- No infrastructure to deliver international CO_2 and CH_4 gas reference materials with uncertainties to meet demands to underpin isotope ratio measurements
- Compromises the comparability of measurement data
- Exploitation of advances in optical spectroscopy for traceable field deployable techniques
- JRP fills a traceability gap – new measurement infrastructure for stable isotopes of CO_2 and CH_4 (gas reference materials, calibration methods and instrumentation)



Example datasets from Jungfraujoch (2007 – 2018)

Data from Max Planck Institute for Biogeochemistry (https://www.bgc-jena.mpg.de/isolab)

Traceability



Objectives

WP1
Next generation carbon dioxide isotope ratio gas reference materials

CO_2 isotope ratio reference materials (pure and 410 μmol mol^{-1})

SI traceable methods for absolute measurements

university of groningen

WP2
First time isotope ratio gas reference materials for $\delta^{13}CH_4$ and δ^2H-CH_4

First CH_4 isotope ratio reference materials (pure and 1.85 μmol mol^{-1})

Linking to CO_2 isotope ratio gas reference materials

VSL Dutch Metrology Institute

WP5
Management and Coordination

Consortium brings high quality and relevant experience

Good complementarity of the partners and tasks ensure all have a valid role

NPL National Physical Laboratory

WP3
Advancing optical isotope ratio spectroscopy for CO_2 and CH_4

Laboratory and field deployable spectroscopic methods and calibration approaches for isotope ratio measurements of CO_2 and CH_4

PTB Physikalisch-Technische Bundesanstalt Braunschweig und Berlin

WP4
Creating Impact

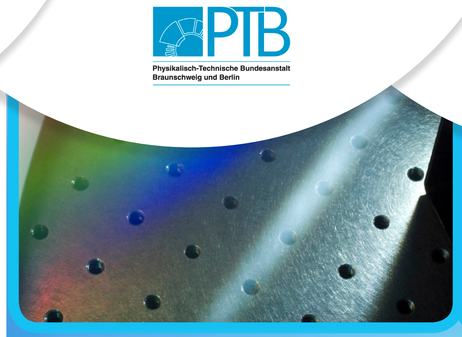
Knowledge transfer

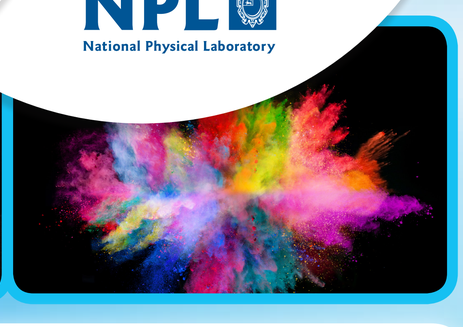
Training

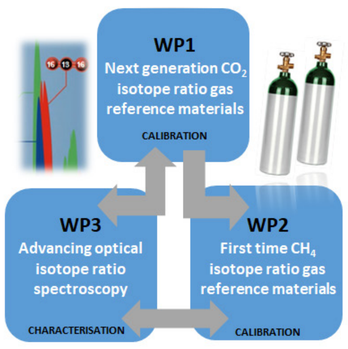
Uptake and exploitation of reference materials, methods and calibration devices

NPL National Physical Laboratory

WP5 Management and Coordination







WP4 Creating Impact

Stakeholders

	Atmospheric Monitoring Community	Reference Material Providers	
Instrument Manufacturers	Standardisation Committees	Specialty Gas Industry	Metrology Community

Quality and efficiency of implementation

- Developing metrology capacity and synergy to meet stakeholder requirements and create a cost-effective approach
- Stimulate innovation through a partnership of NMIs and industry applying relevant metrological and technical expertise
- Partners could only come together under EMPIR and only consortium able to achieve these objectives
- Appropriate management structures, procedures and risk mitigation plans

Impact and uptake

- More accurate, comparable data to separate the various man-made sources and natural contributions of greenhouse gases in the atmosphere and local source apportionment
- Enable governments to develop accurate emission inventories and models to comply with legislation (Kyoto Protocol, COP21), inform new policy, better abatement strategies and mitigate emissions
- Impact on quality of life and the health of EU citizens. Lower uncertainty in measurement - cheaper compliance with directive 2008/50/EC on air quality
- Industrial and other user communities (new reference materials, instrumentation, methods and recommendations will benefit gas metrology, instrument manufacturers, speciality gas companies and the atmospheric monitoring community)
- Metrology and user communities (CCQM, WMO-GAW, IAEA and IUPAC-CIAAW)
- Relevant standards (ISO/TC158 - Gas Analysis and CENTC/264 - Air Quality)
- Key stakeholders engaged as collaborators and to facilitate access to JRP outputs

Collaborators

WMO • FAAM • KRISS • BOC • CEN • ISO • Aerodyne • ABB • NU Instruments • SIAD • LI-COR • NIPPON • Masaryk University • NIWA • Krawkow University of Science and Technology • CNR-Institute for Atmospheric Pollution (Italy) • IUPAC-CIAAW

Partners

NPL National Physical Laboratory • Empa Materials Science and Technology • PTB Physikalisch-Technische Bundesanstalt Braunschweig und Berlin • VTT • INRiM Istituto Nazionale di Ricerca Metrologica • DFM Danmarks Nationale Metrologiinstitut • TÜBİTAK UME • university of groningen • Air Liquide creative oxygen • Max-Planck-Gesellschaft • University of Eastern Finland • IJS • VSL Dutch Metrology Institute • LGC