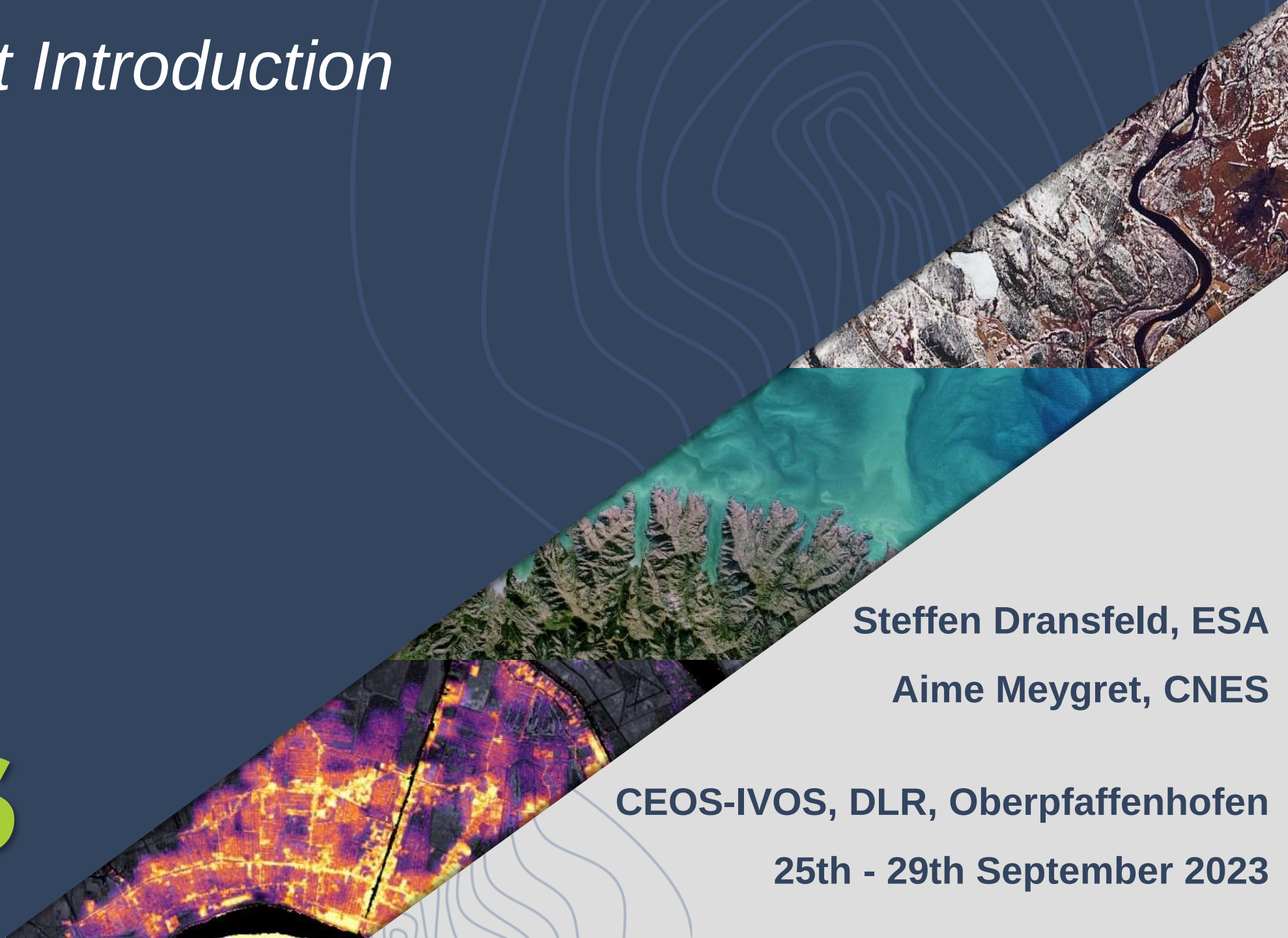
TIRCALNet Introduction



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TIRCALNet Context

As per CNES WGCV presentation last year:

- Several TIR missions operational: ECOSTRESS, ASTER, LANDSAT-8&9, MODIS, VIIRS, SLSTR, SEVIRI…
- TIR future missions with higher resolution: TRISHNA, LSTM, SBG
- More and more demanding LST accuracy requirements better than 0.1 K for climate studies
- Importance of vicarious calibration for the validation of on-board calibration systems (black bodies) or direct calibration
- L2 products (temperature & emissivity) validation need

In addition numerous new space TIR companies are about to launch: ConstellR, Ororatech, Aistech,…

TIRCALNet Objectives

- To collect surface temperature and emissivity, and atmospheric data necessary for the simulation of observations by TIR optical sensors and thus verify their radiometric calibration
- To increase the number of matchups between in-situ measurements and space sensor observations and reduce the overall uncertainties, and reduce the efforts of individual agencies
- To ensure traceability of the space sensor radiometry to the “Système International” (SI)
- To support the establishment of the Global Earth Observation System of Systems by providing measurements to verify the radiometric consistency between EO space sensors
- To build on success and experience return from RadCalNet network dedicated to VNIR-SWIR optical sensors cal/val

Current Limitations of LST Sites

- Spatial representativeness of the in situ reference measurements
- Directional effects
- Lack of emissivity measurements
- Data access
- Data harmonization
- Typically do not provide TOA radiances
- Data quality assurance (error budget traceable to SI)
- In situ instruments calibration quality and traceability
- Needs for the development of denser ground-based reference Network

First activities for TIRCALNet

ESA and CNES defined after discussions with domain and agency (CNES, ESA & NASA) experts that TIRCALNet should be able to provide TOA Brightness Temperature signals propagated from BOA measurements of ~ 0.5K uncertainty and a set of tasks were identified :

- Task 1 → Identification of uncertainty contributors to TOA-derived BT
- Task 2 → Sensitivity analysis of uncertainties on TOA BT estimation
- Task 3 → Definition of best site characteristics, optimal instrumentation and forward propagation scheme
- Task 4 → Selection of potential candidate sites based on Task 3
- Task 5 → Interaction with Working Groups and network roadmap

Next steps towards other sites

- Transfer of CNES La Crau uncertainty budget template to other sites (e.g. from ESA LAW project) and perform similar simulations to gain an understanding how site environment may influence the uncertainty.
- Development of a site measurement and forward propagation protocol to minimise uncertainties at TOA
- Analysis of site characteristics (surface, cloud cover, etc.) to find possible candidate sites (e.g. Lake Tahoe, Acqua Alta platform, Russel Ranch, Lake Constance, Gobabeb)
- Develop a roadmap to equip and operate sites
- Discussions with partnering agencies on how to collaborate and set up and operate networks (funding for instrumentation, site operation, data analysis, supporting studies, etc.)
- Choice of an initial space reference sensor should also be made