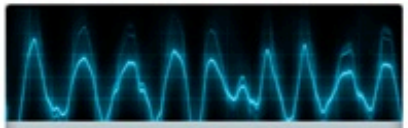
NOVELTIS

Innovating to protect our World's Life



Ionospheric correction

CP4O final meeting

02/07/2014

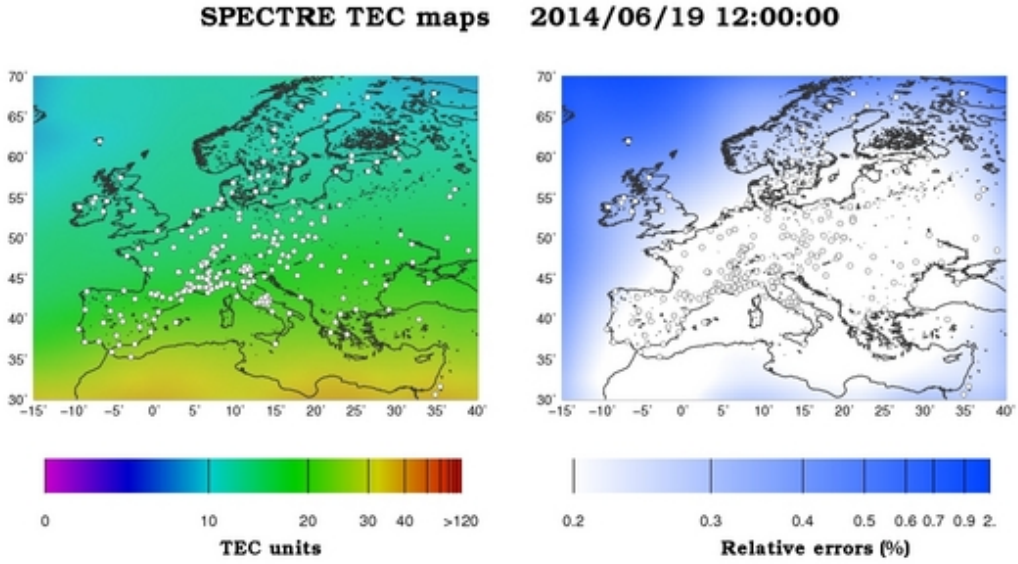
afaq ISO 9001 Qualité AFNOR CERTIFICATION

Ionospheric correction

- Ionospheric corrections for altimetry data
  - Dual-frequency altimeter (when available)
    - S-band loss on Envisat ➔ no correction after cycle 65
    - Not available for CryoSat-2
  - Global Ionosphere Maps (GIM)
    - 5°x 2.5°maps
    - Update frequency: 2 hours
  - BENT model
    - Used as an alternative when GIM is unavailable for CryoSat-2
    - Limited to latitudes under ±82 degrees

Ionospheric correction

- SPECTRE service: http://www.noveltis.com/spectre/
  - History:
    - Early developments with the support of ESA and the French Ministry of Research
    - Since 2005, maintained on NOVELTIS own funds
    - Complete reprocessing in 2009
    - Validation against ionosonde and altimeter measurements (Crespon et al., 2007)



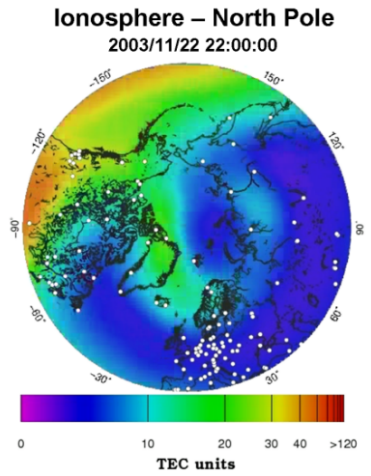
Ionospheric correction

- SPECTRE service
  - Features:
    - Available from 2004 to present
    - More than 300 GNSS stations processed over Europe
    - 2.5°x 2.5°maps
    - Update frequency: 30 seconds
  - Innovation for altimetry data
    - Provide an accurate ionospheric correction based on measurements
    - More precise than the Global Ionosphere Maps (GIM) from JPL

    → Better spatiotemporal resolution: better sampling of the high frequency events.

Ionospheric correction

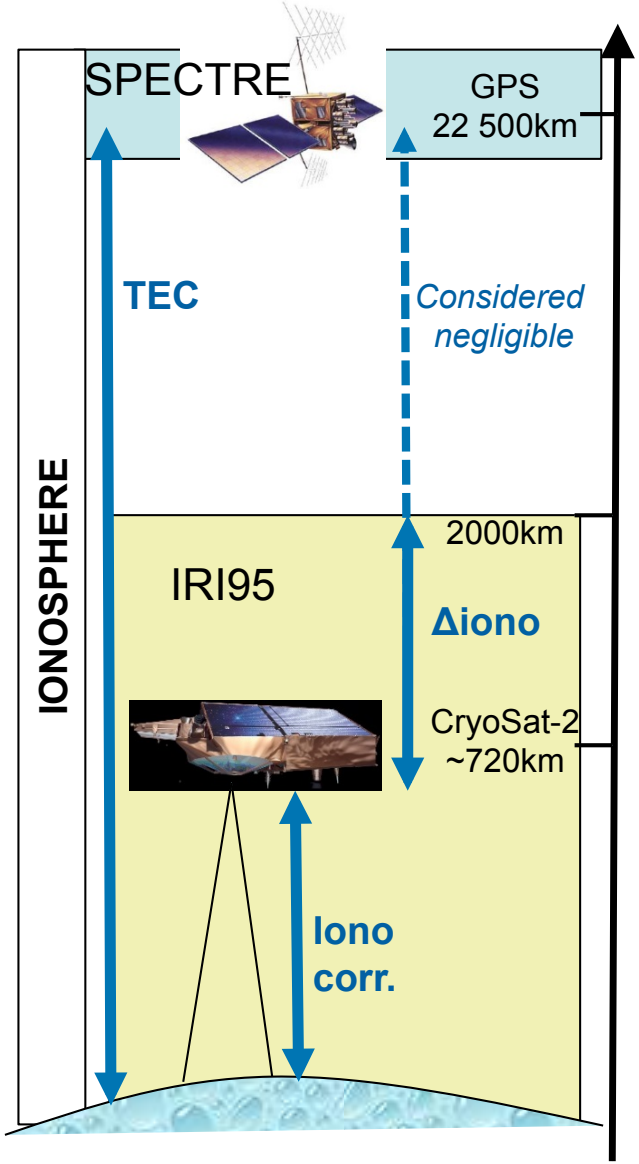
- SPECTRE service applications:
  - Geophysical studies by IPGP
    - Detection of gravity and infra-sound waves generated by tusnami & seisms
  - CNES R&D study
    - Combination of GPS+DORIS for a mono-frequency radar altimeter
  - FP7 SOTERIA
    - Specific processing of extreme Space Weather Events: ionospheric storm at high latitudes (North Pole) → demonstrated on some specific events
  - FP7 POP-DAT
    - Database of Traveling Ionospheric Disturbance events for data-mining (Space Weather studies)
  - CP4O
    - Computation of a ionospheric correction for Cryosat-2 over Europe (NEA + Med)
  - + other on-going projects in space weather



Ionospheric correction

- Specific processing for CP4O
  - Extract the Total Electronic Content (TEC) from the SPECTRE database
    - at the location and date of the CryoSat-2 measurements (European coasts)
    - From January 2011 to January 2013
  - Remove the ionosphere contribution between CryoSat-2 and the GPS constellation (Δiono)
    - IRI95 (standard model), dependency to the solar activity
    - Ionosphere content is not linear
  - Compute the ionospheric correction for CryoSat-2

➔Evaluation performed by CLS, in collaboration with NOVELTIS (see T. Moreau's presentation).



Ionospheric correction

- Perspectives for SPECTRE in altimetry
  - SPECTRE maps in the Arctic Ocean
    - North Pole (down to 40°N) demonstrator already exists
    - Magnetic storms stronger in the high latitudes
  - Global SPECTRE maps
  - NRT SPECTRE ionospheric correction
    - Today, maps produced with a 2-day delay
    - Some adaptations required to upgrade the service and generate regional maps within a 3-hour delay
  - Comparison between the various empirical ionospheric models used to compute the correction
    - IRI95/2001/2007/2012, SPIM, etc…
    - Impact on the scaling factor between the GPS satellites and the altimeter satellite