



The TechTIDE service: Detection of Travelling Ionospheric Disturbances

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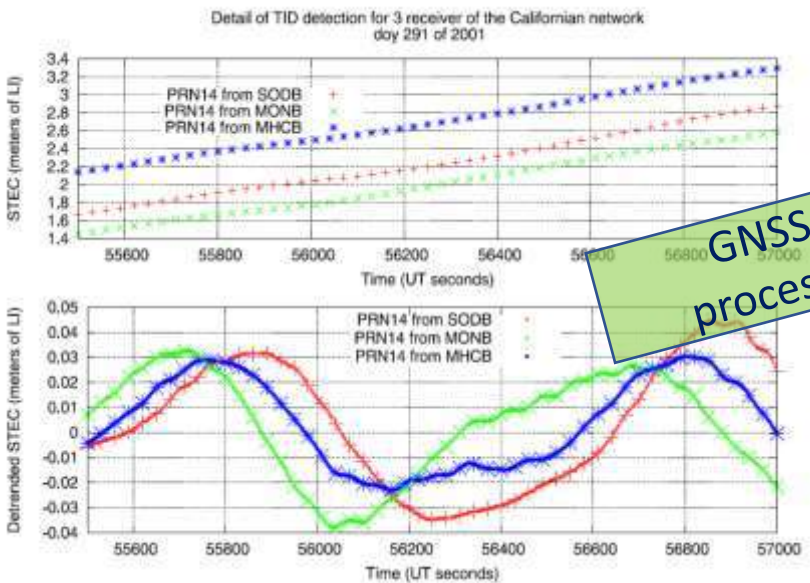
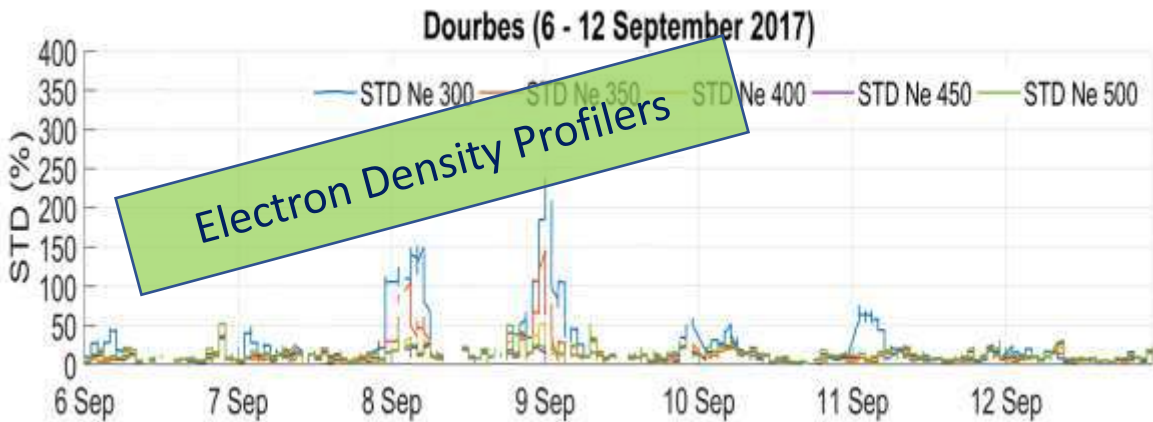
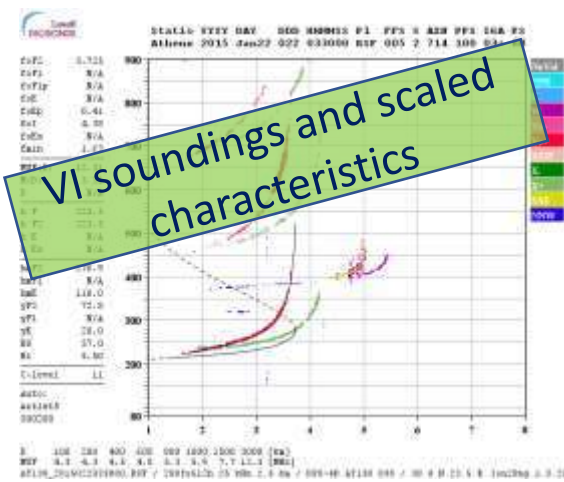
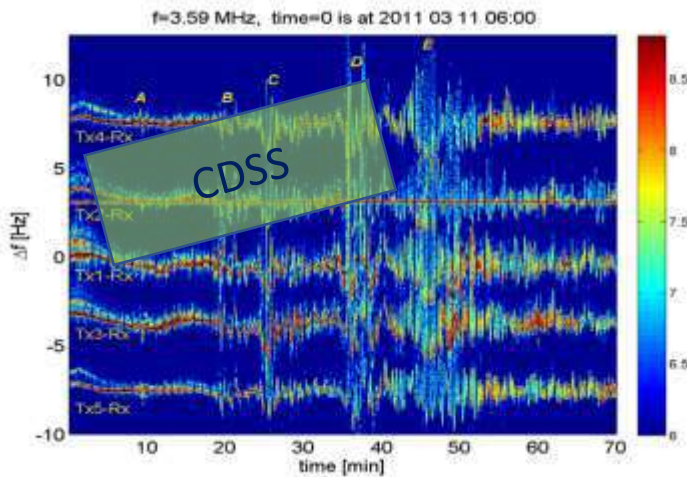


About TechTIDE

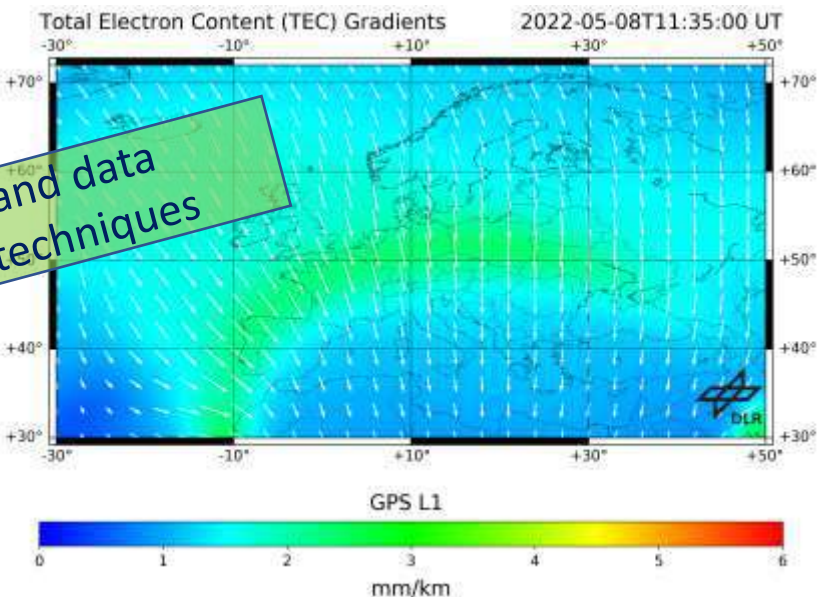
- TechTIDE development phase was funded under the EC Horizon 2020 Programme (COMPET-5 Space Weather)
- TechTIDE developed validated methodologies for the near-real time detection of MSTIDs and LSTIDs, able to support mitigation strategies for the technologies concerned
- In SWESNET project, selected TechTIDE products will be integrated as a SWE federated service, to cover the users' requirement for direct and timely information of ionospheric perturbations due to TIDs. This need has been formulated as a clear customer requirement (marked "essential") for the Space Weather segment of the Space Situational Programme (SSA) of the European Space Agency (ESA) (Space Situational Awareness - Space Weather Customer Requirements Document, SWE-CRD-TIO-1636).



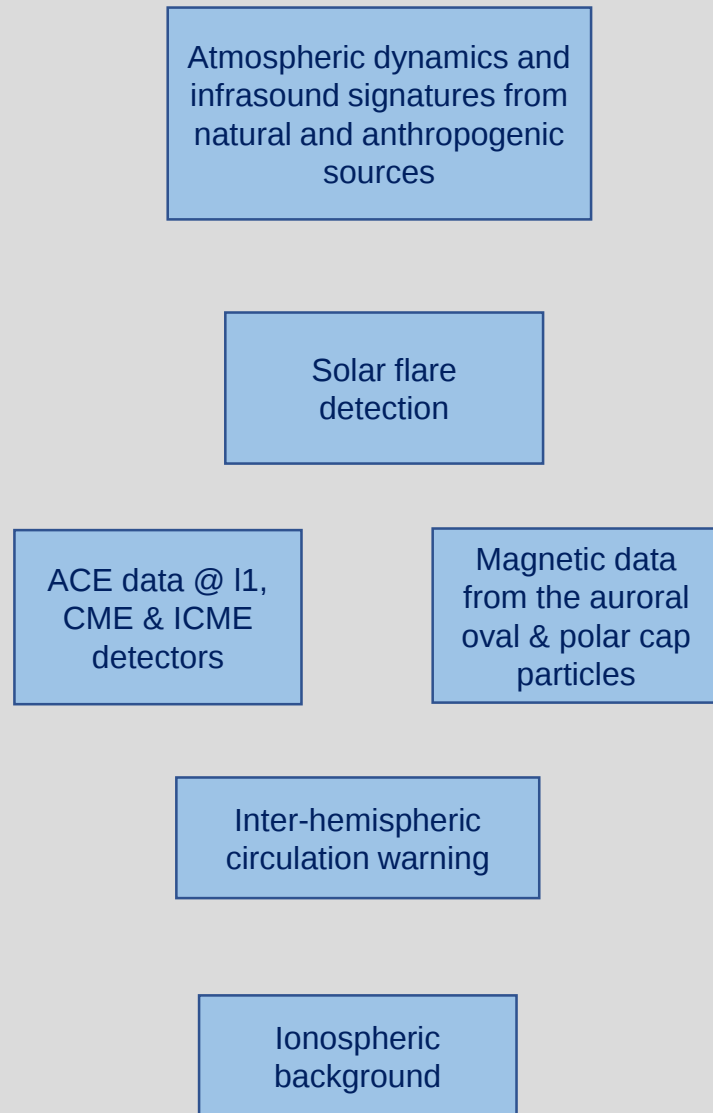
How we detect TIDs in TechTIDE



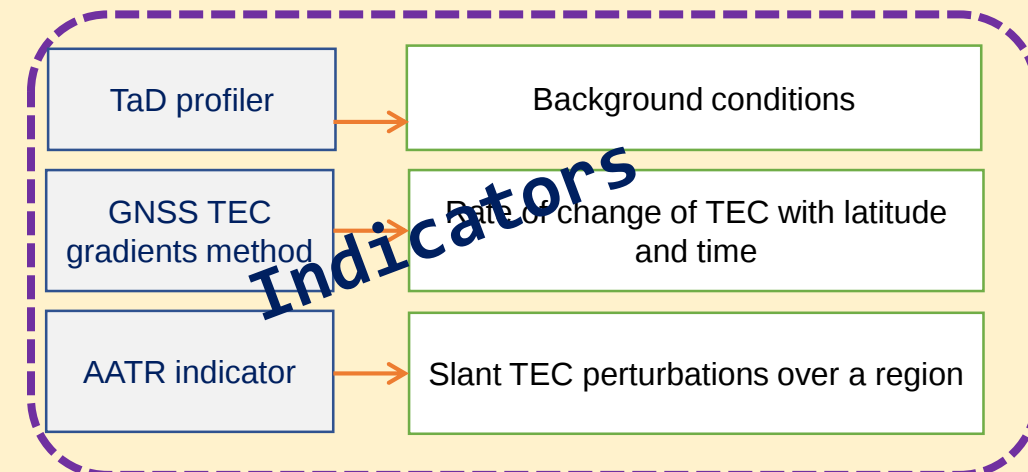
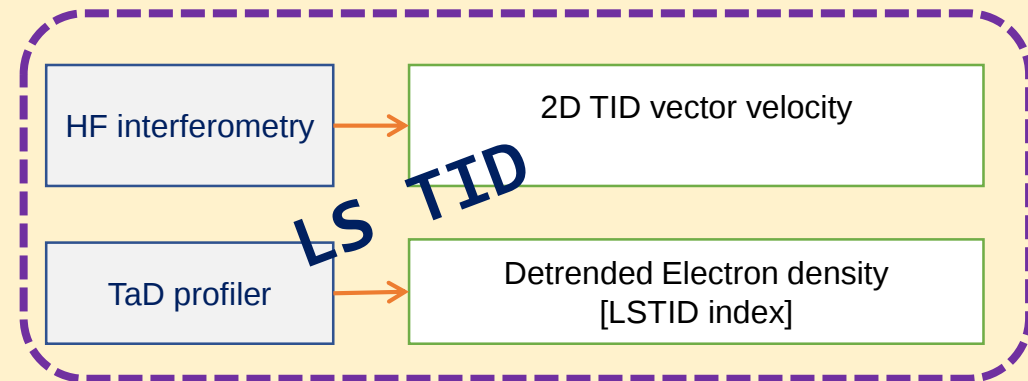
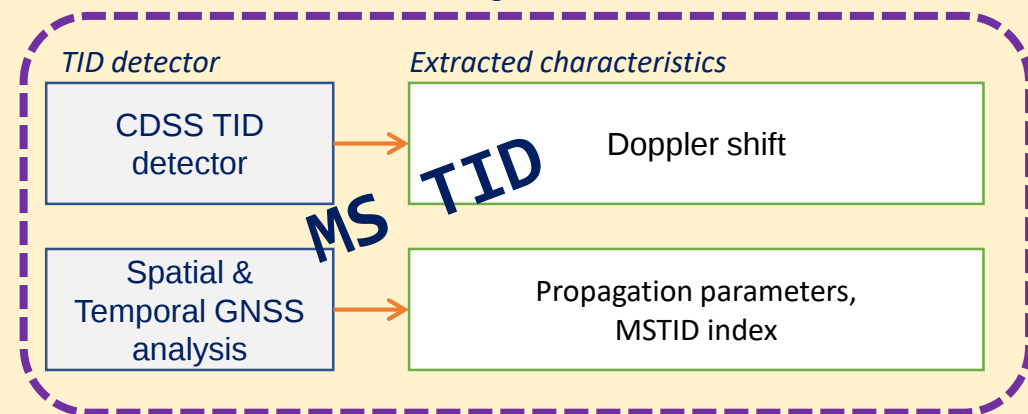
GNSS TEC and data processing techniques



TID drivers

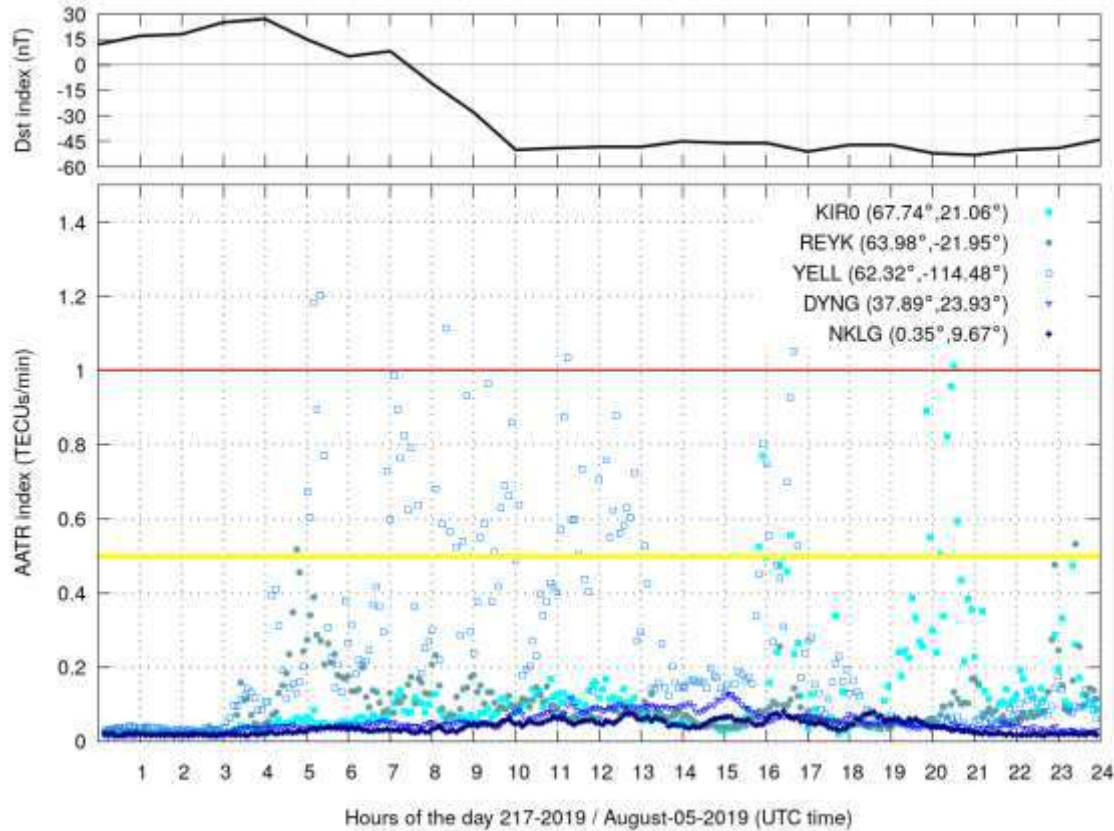


TID algorithms



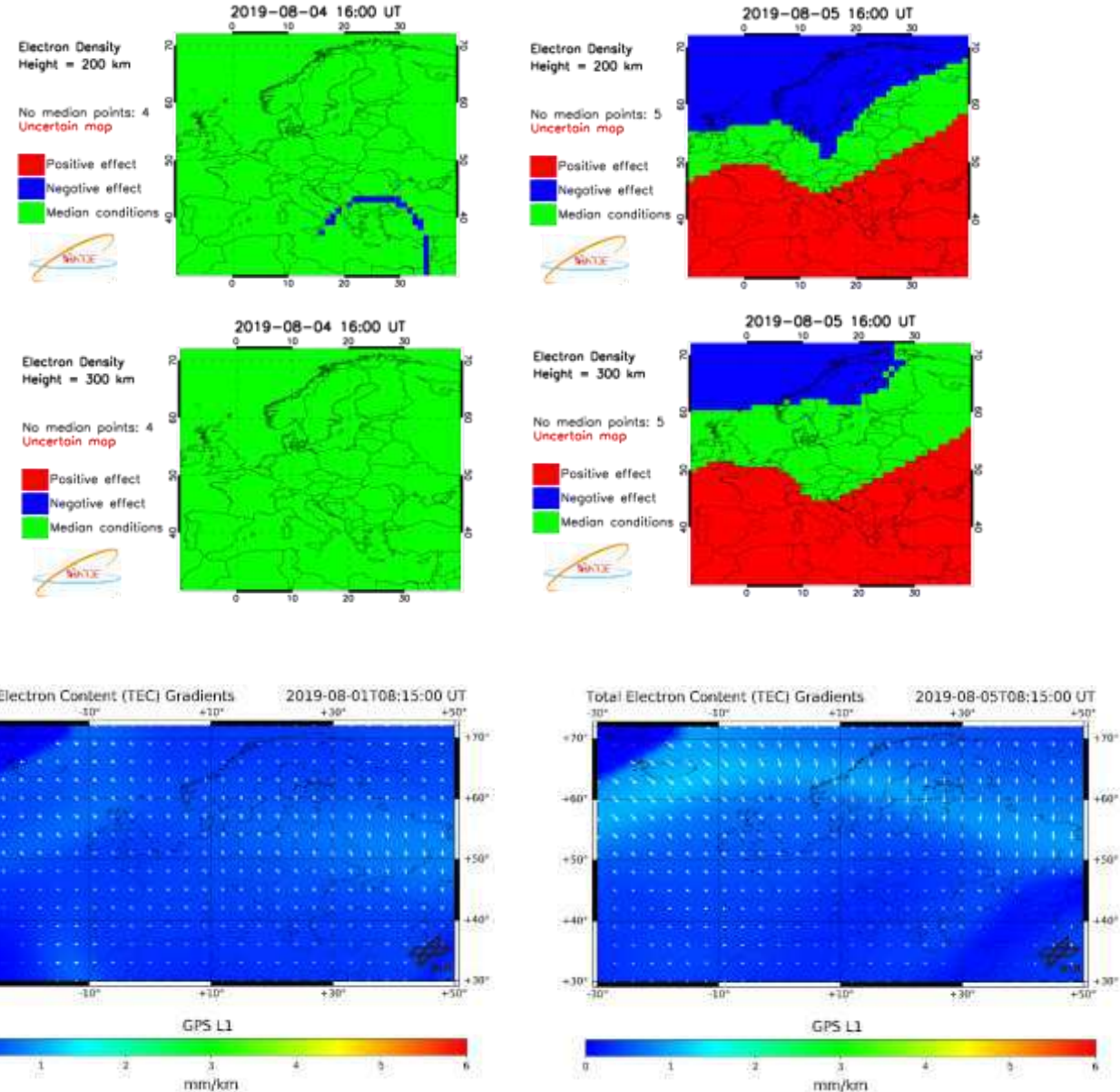
TechTIDE products : indicators

Results for a moderate geomagnetic storm occurred on 5 August 2019



Pre-storm day

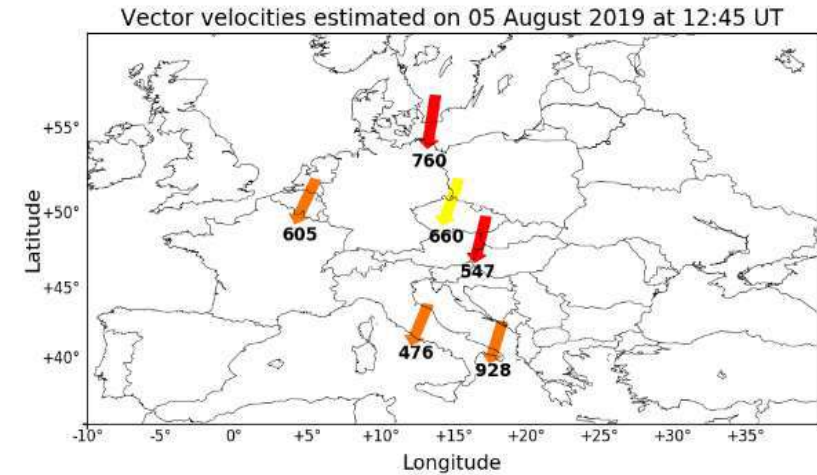
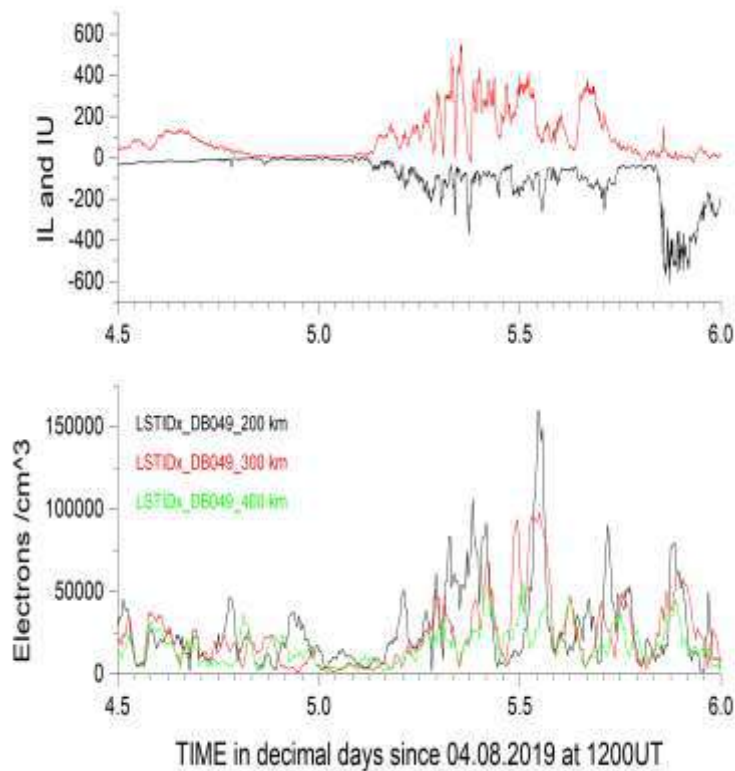
Storm day



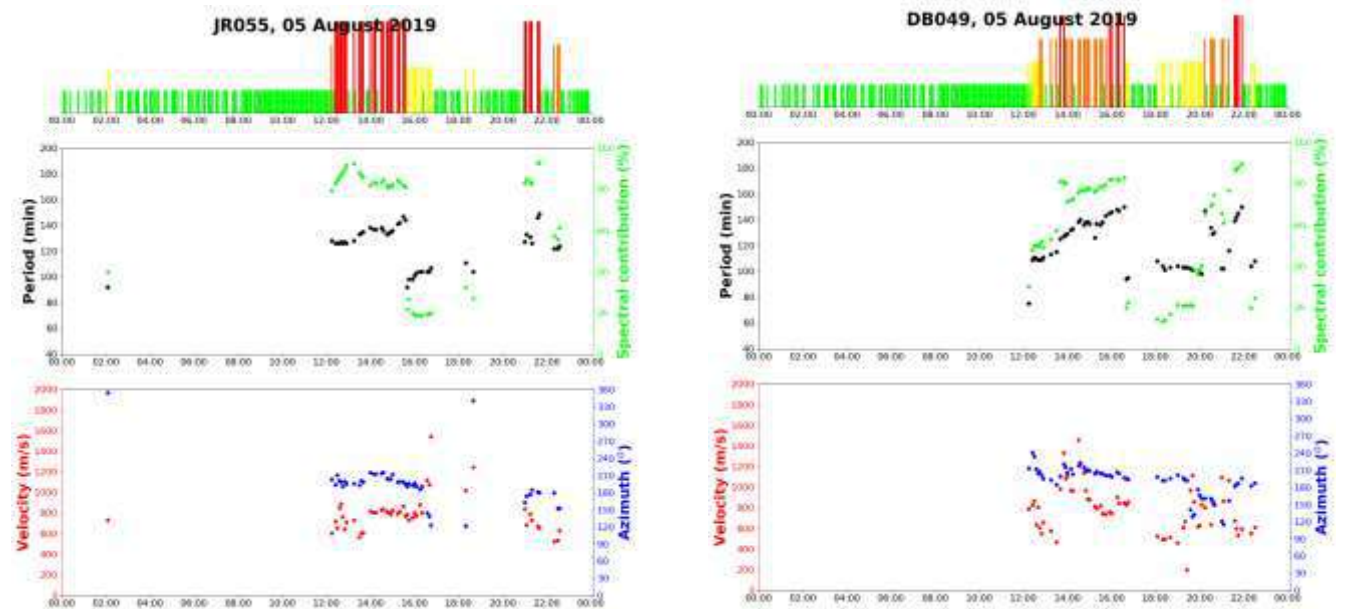
TechTIDE: LSTID identification

Results for a moderate geomagnetic storm occurred on 5 August 2019

LSTID index over Dourbes

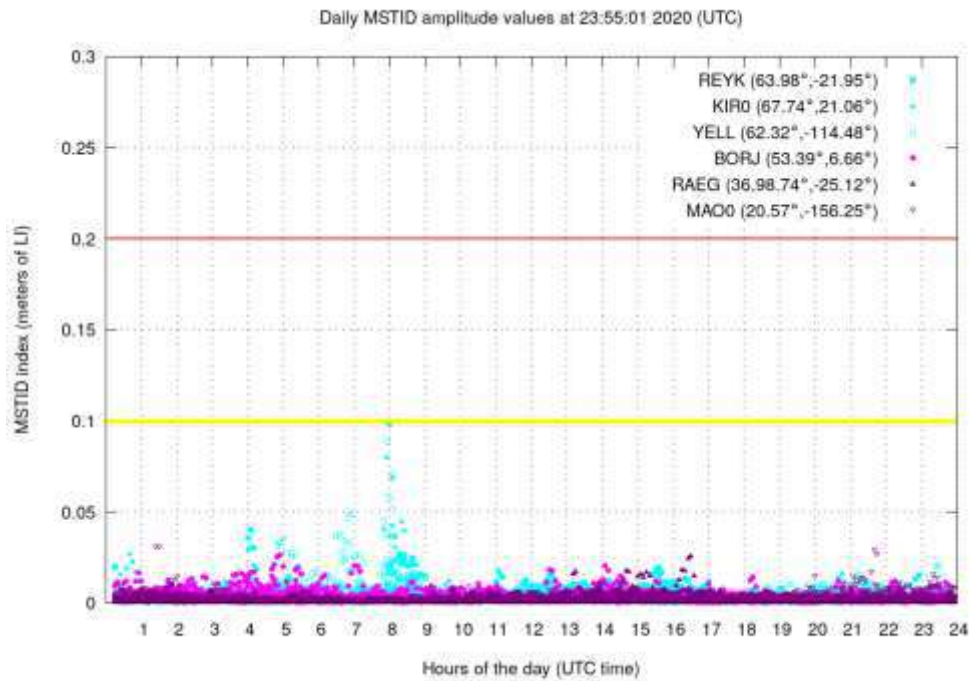


HF Interferometry results over Juliusruh and Dourbes

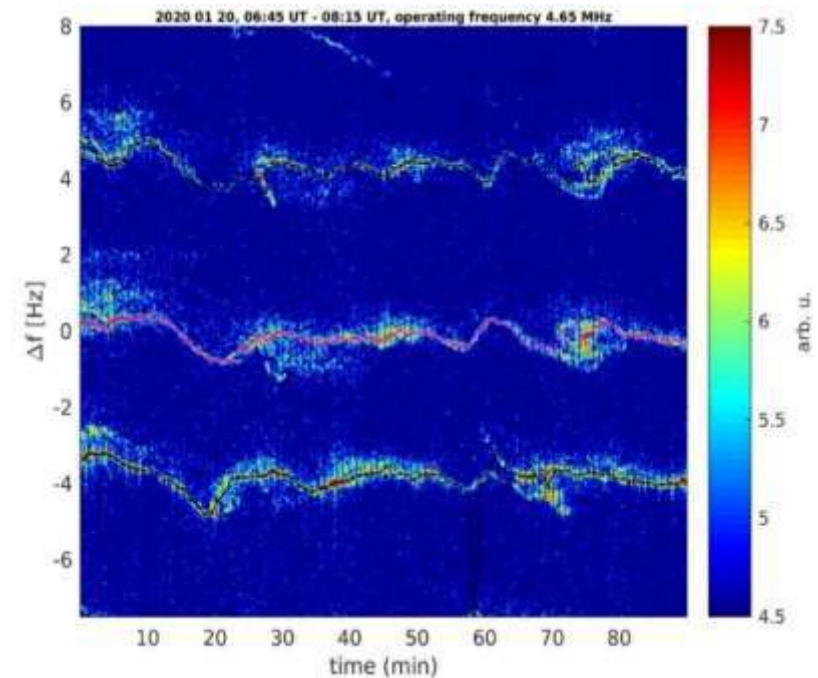
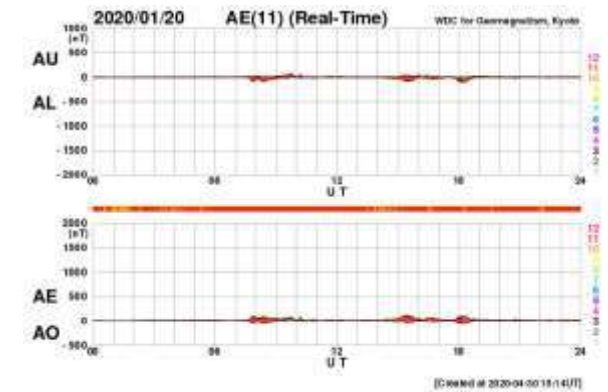


TechTIDE: MSTID identification

Results for a geomagnetically quiet day 20 January 2020



MSTIDidx at 6 GNSS receivers (high, middle, low latitudes) for the whole day



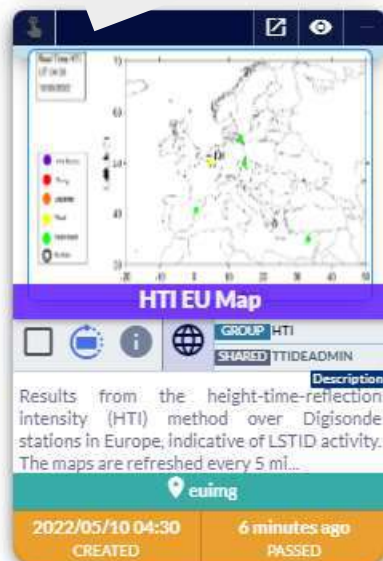
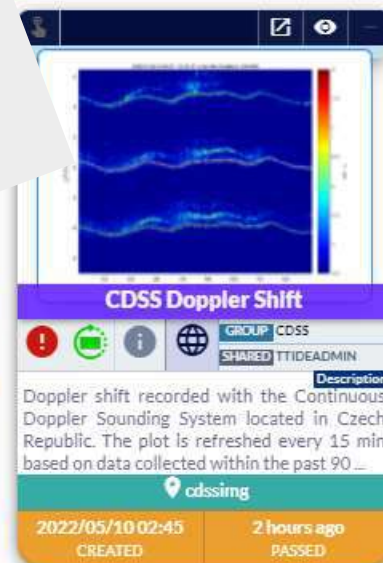
Doppler shift amplitude recorded from the CDSS in Czech Republic from 0645 UT to 0815 UT

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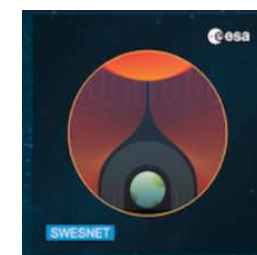
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TID detection results are available in real-time with open Access in tech-tide.eu





TechTIDE/SWESNET team: from an OA service to an SSO service adjusted to ESA SWE specifications



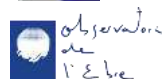
☐ National Observatory of Athens (NOA), Greece



☐ Deutsches Zentrum für Luft- und Raumfahrt (DLR), Germany



☐ Ústav Fyziky Atmosféry AV ČR (IAP), Czech Republic



☐ Observatorio del Ebro Fundación (OE), Spain



☐ Universitat Politècnica de Catalunya (UPC), Spain

Data providers:

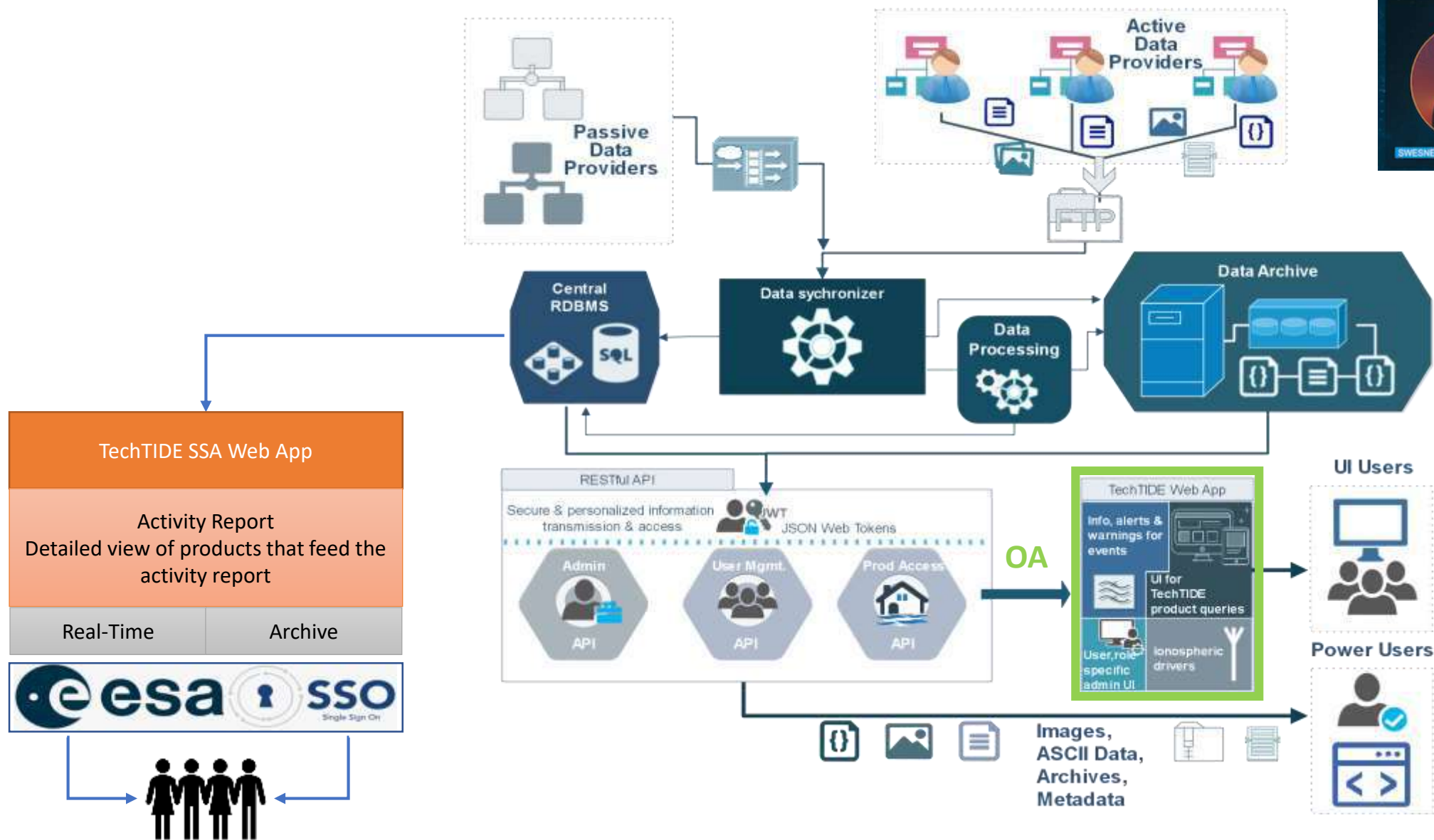
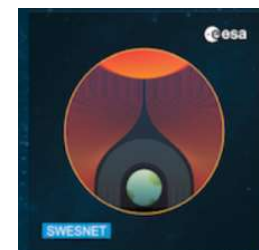


➤ Institut Royal Météorologique de Belgique (RMI), Belgium



➤ Leibniz Institute of Atmospheric Physics, Rostock University (L-IAP), Germany

The TechTIDE service architecture



TechTIDE service landing page: The TID activity metrics



Real-Time
view

Archive
mode

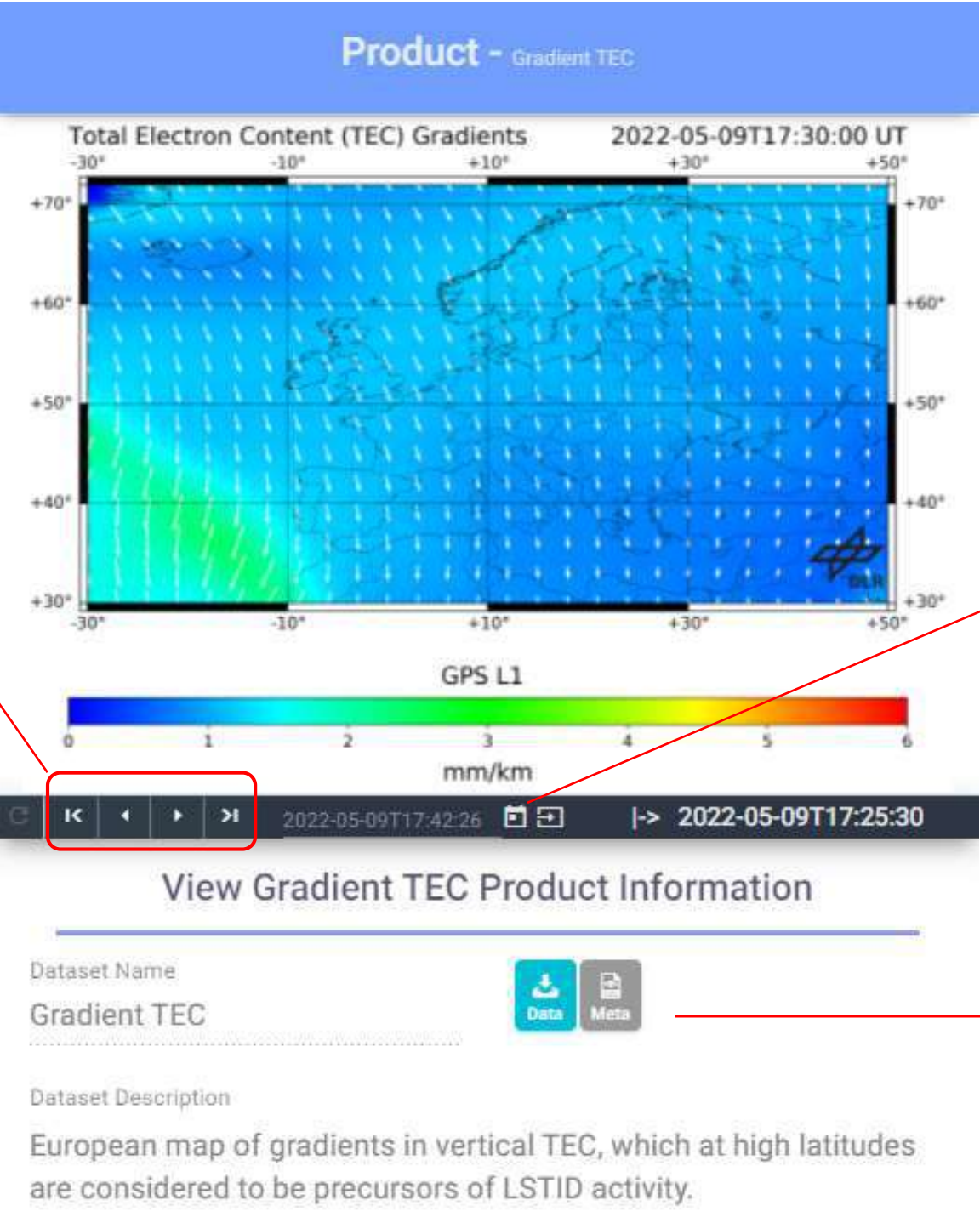
Most recent conditions: Median conditions are dominating @ 2022-05-08T17:15:00 UTC					
 View TID Activity Reference Date: 2022-05-08T17:45:00 UTC    					
LSTID Detection	Date	Critical Characteristic	Current value of critical characteristics	Activity level	ACVICO
AATR	2022-05-08T11:15:00	AATR at any location	0.076	LOW	
GNSS TEC Gradient	2022-05-08T17:40:30	TEC gradient amplitude in high latitudes	1.971	MEDIUM	
HF Interferometry (HF-INT)	2022-05-08T17:45:00	Spectral Energy Contribution	5	LOW	
MSTID Detection	Date	Critical Characteristic	Current value of critical characteristics	Activity level	ACVICO
CDSS	2022-05-08T16:00:00	Doppler shift detected in the Czechia network	0.06	MEDIUM	
MSTID _{idx}	2022-05-08T11:20:00	MSTID _{idx} at any location	0.418	STRONG	

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TechTIDE SSO service development timeline



Phase	Planned delivery
Definition	June 2022
Implementation	September 2022
Federation & Readiness	October 2022
Review & Integration	November 2022
Operation	December 2022 – August 2023