WG4: Data Inversion and Assimilation WG activities

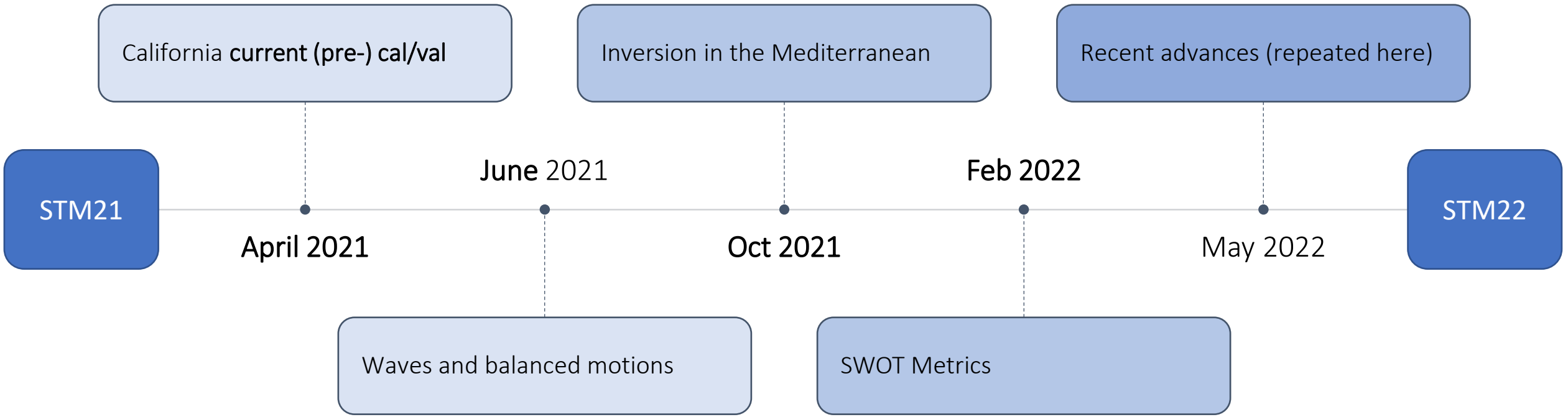
- SWOT Science Team meeting June 2022
- US / French splinter groups

- Emmanuel Cosme, Sarah Gille, Shane Keating, Pierre-Yves Le Traon

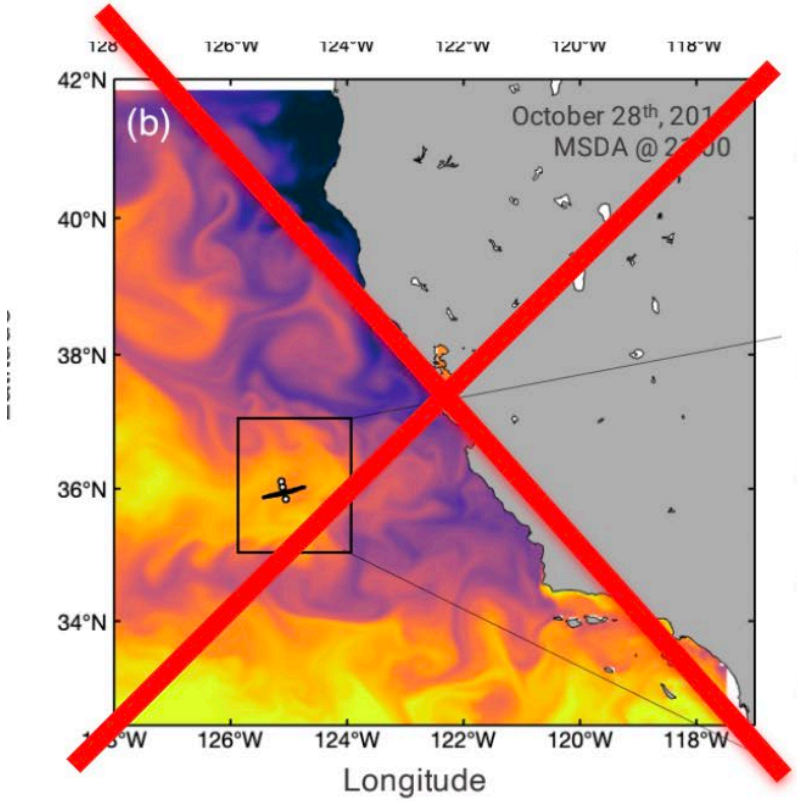
Key goals and challenges

- **Facilitate collaboration** across science team for mapping and assimilation problems
- **Thematic workshops** every 2-3 months, open to anyone
- Themes chosen from both domain and method perspectives
- Share announcements for other relevant events (e.g. SIO webinars)
- Best practices
- Metrics and intercomparisons

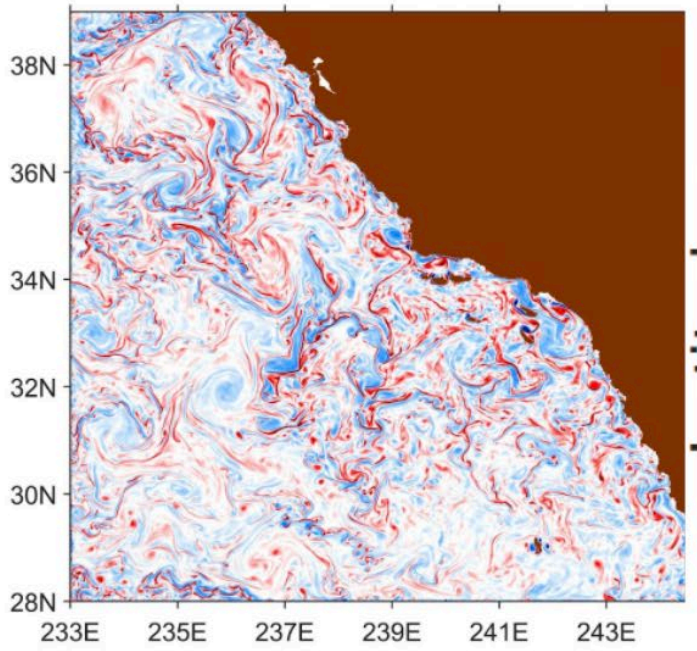
WG 4 Activities



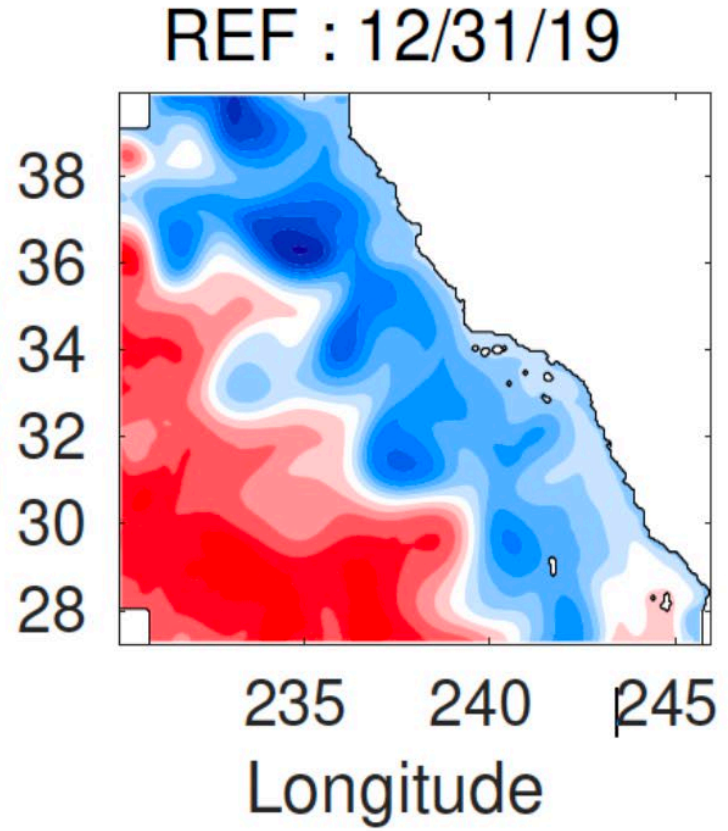
Workshop 1: California Current hi-res mapping for pre-cal/val and cal/val domain



JPL: multi-scale 3-D Var using ROMS



NRL: NCOM-3DVAR (1 km)

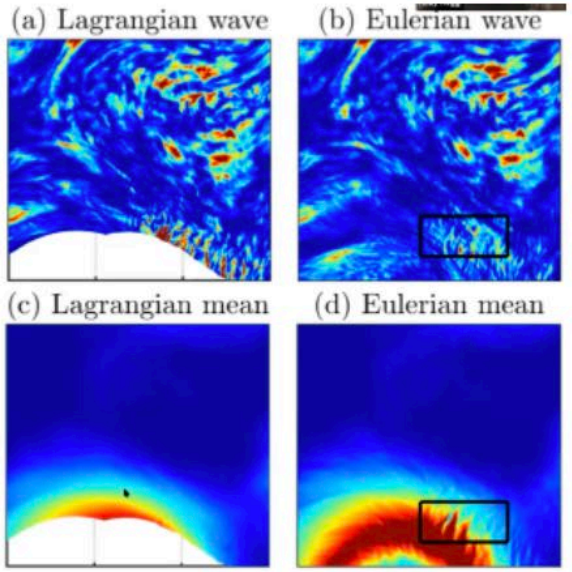


SIO and JPL: 4-D Var using MITgcm

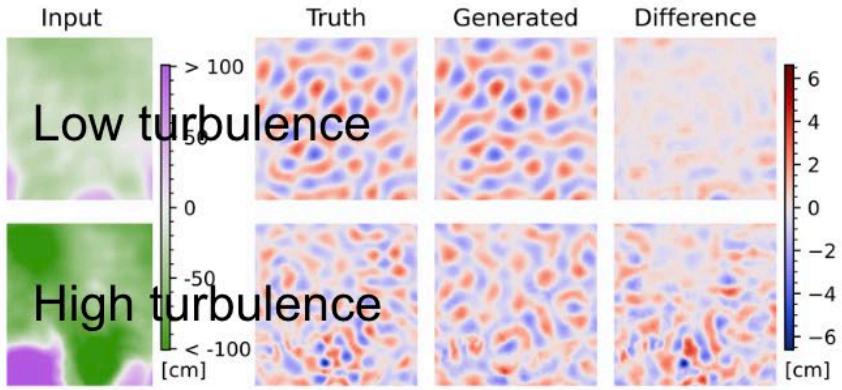
Focus on California Current for CalVal; intercomparisons not limited to groups listed here

Workshop 2 (with WG1): Separating internal waves from balanced motions

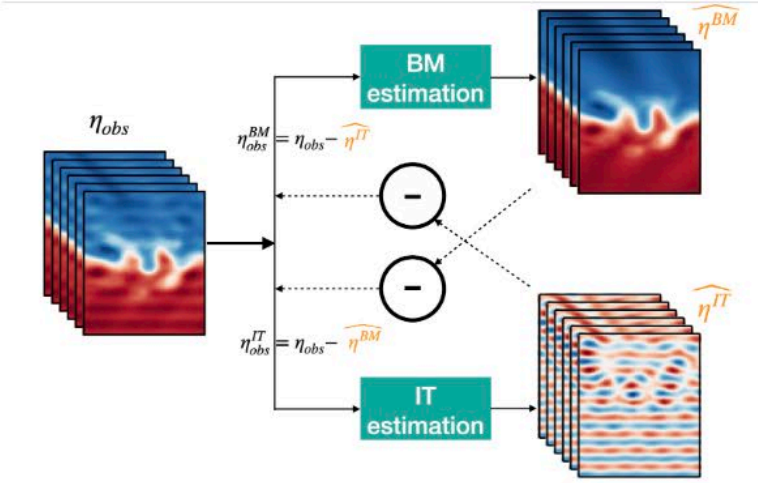
Lagrangian filtering (Andy Hogg/Spencer Jones) - provides rigorous benchmark to test separation methods



Deep learning (Han Wang, Nicholas Grisourd) - First steps with simple setup are encouraging. High turbulence makes internal tides incoherent and separation difficult.



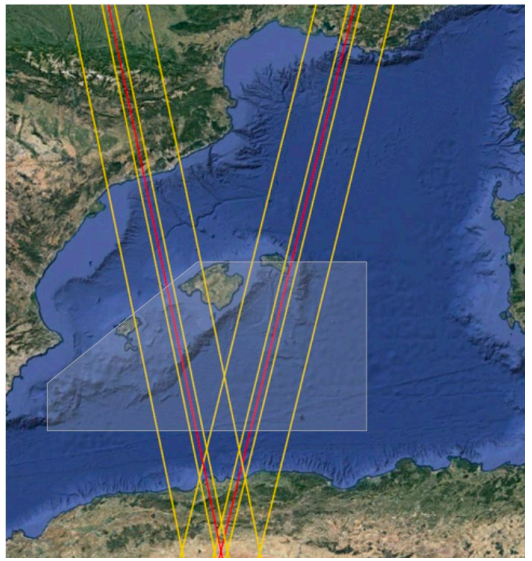
Iterative back-and-forth nudging + 4DVar (Florian Le Guillou et al.) - First steps with simple setup are encouraging. High turbulence makes internal tides incoherent and separation difficult.



Diversity of approaches with good results in idealized setups - but none yet ready for real SWOT data…

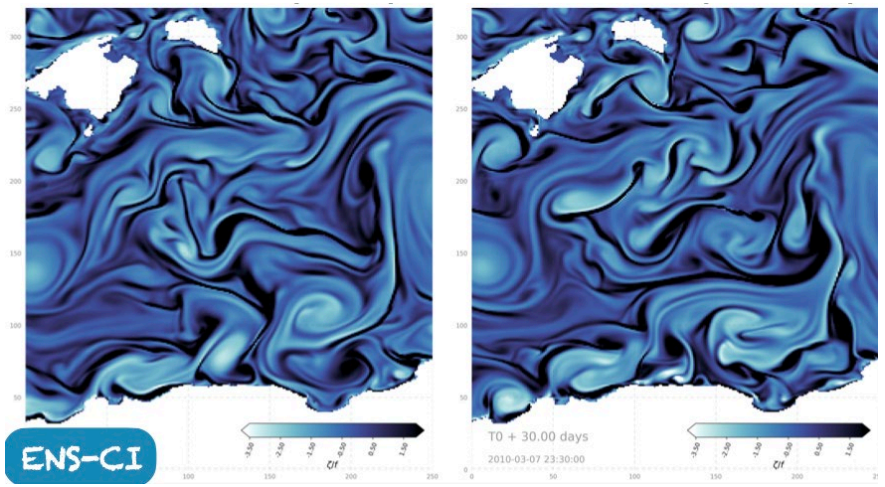
Workshop 3: Inversion activities in the Mediterranean

- Limited but well-focused participation from LOCEAN, IMEDEA, IGE
- Presentations on the SWOT challenges in the Med Sea, inversion activities, HR **ensemble simulation**, mapping tools
- Coordination of parties for an ANR (French NSF) proposal (d'Ovidio, submitted)



SWOT Xover in the Med Sea

2 1/60° ensemble members



Workshop 4: SWOT metrics workshop

- How to quantify the contribution of SWOT for ocean analysis (incl. mapping) and forecasting ?

- Can we define useful/common metrics to facilitate the intercomparison ot results between SWOT science teams both for simulated data (eg OSSEs) and real data (OSEs) ?

- Metrics => Standard statistics that compare SWOT results (analyses and forecasts) with a reference (e.g. OSSEs, in situ, nadir altimeters) or with results derived without SWOT (e.g. OSEs): RMSE for full fields or for special spectral bands, F/W spectra of errors (OSSEs), normalized spectra, coherence analysis, resolved scales, Lagrangian analyses, etc.

- Main recommendations : need to continue to share approaches on the way to assess the impact of SWOT observations and encourage SWOT science teams to adopt common metrics to facilitate the intercomparision of results.

SWOT-ST22: French splinter session

Talks

- Yannice Faugère (CLS): SWOT in DUACS multimission products [10']
- Anaelle Treboutte (CLS): DUACS/L3: Karin noise reduction using AI techniques [10']
- Valentin Bellemin Laponnaz (CLS): SWOT global SSH maps performances using OSSEs, comparison with existing Nadirs [10']
- Mounir Benkiran (MOI): Assimilation of SWOT in the MOI system [10']
- Emmanuel Cosme (IGE): Eddy/wave separation in the California Current region from altimetric data assimilation [10']
- Juan Emmanuel Johnson (IGE, remote): Implicit Neural Representations for Sea Surface Height Interpolation [10']

Discussion [30']

SWOT-ST22: US splinter session

(1) California Current presentations

a) Florian Le Guillou, Grenoble, presented by Sarah Gille, SIO (remote), idealized assimilation experiments for the California Current [6-8 minutes]
b) Yu Gao, SIO (postdoc talk, in person), preliminary results: assimilation with correlated error removal [6-8 minutes]
c) Joseph D'Addezio, NRL, (in person) new results from S-MODE assimilation [10 minutes]
d) Discussion of first 3 talks [10 minutes]
e) Jinbo Wang (in person), intro to the JPL California Current assimilation effort [10 minutes]
f) Babette Tchonang, JPL, (remote) ECCO-SWOT production run [10 minutes]
g) Ganesh Gopolakrishnan or Matt Mazloff or Bruce Cornuelle, SIO (remote), Update on 4dVar state estimate tests in the California Current [10 minutes]
h) Discussion of last 3 talks and California Current discussion [15 minutes]

(2) Overall discussion of global and regional assimilation priorities [10 minutes]