Discussion topic 2

Expected benefits and requirements for velocity observations from space, for operational oceanography.

Expected benefits of TSCV data from space for operational oceanography

Improved accuracy of surface currents through their **assimilation**. Knock-on improvements to the currents at depth, and improvements in other model variables. Demonstrated in A-TSCV OSSEs.

Improved representation of surface currents through **ocean model improvements** based on model-observation comparisons.

Improved **coupled models** through better representation of momentum exchanges between ocean, waves, sea-ice and atmosphere.

-> Better meeting the requirements of **users of operational ocean forecasts**, e.g.:

- Search & rescue; oil spill modelling; ship navigation; offshore industry operations.

-> Better ocean, waves and sea-ice forecasts in **coupled NWP and seasonal forecasting**.

Operational oceanography requirements for TSCV data from space

Type of requirement:

- Horizontal resolution
- Temporal resolution
- Timeliness
- Required measurement uncertainty
- Important regions;
- Need for estimates of the uncertainties: random uncorrelated, random correlated, bias.
- Need for reference observations for cal/val of the satellite data, and for use as “anchor” observations in the assimilation if bias correction is needed.

Existing GCOS 2022 requirements

https://library.wmo.int/doc_num.php?explnum_id=11318

- G = Goal (ideal data) B = Breakthrough (intermediate) T = Threshold (useful data)
- Temporal resolution (or frequency) – the frequency of observations

4.5.1 ECV Product: Ekman Currents

Name	Ekman currents				
Definition	Ocean vector motion occurring over the depth of the Ekman layer as a result of the combined action of surface winds and Coriolis force.				
Unit	m s^{-1}				
Note					
Requirements					
Item needed	Unit	Metric	[1]	Value	Notes
Horizontal Resolution	km		G	10	
			B	20	
			T	25	
Vertical Resolution			G	-	N/A
			B	-	
			T	-	
Temporal Resolution	h		G	1	
			B		
			T	6	
Timeliness	h		G	1	
			B		
			T	3	
Required Measurement Uncertainty (2-sigma)	m s^{-1}		G	0.02	
			B		
			T	0.1	
Stability			G		
			B		
			T		
Standards and References					

4.5.2 ECV Product: Surface Geostrophic Current

Name	Surface Geostrophic Current				
Definition	Ocean vector motion measured at or near the surface (at stated depth).				
Unit	m s^{-1}				
Note					
Requirements					
Item needed	Unit	Metric	[1]	Value	Notes
Horizontal Resolution	km		G	10	
			B	20	
			T	100	
Vertical Resolution			G	-	N/A
			B	-	
			T	-	
Temporal Resolution	d		G	1/4	
			B	1	
			T	7	
Timeliness	d		G		
			B		
			T	1	
Required Measurement Uncertainty (2-sigma)	m s^{-1}		G	0.02	
			B		
			T	0.1	
Stability			G		
			B		
			T		
Standards and References	Villas Bôas et al. (2019) Integrated Observations of Global Surface Winds, Currents, and Waves: Requirements and Challenges for the Next Decade. Front. Mar.Sci. 6:425. doi: 10.3389/fmars.2019.00425 http://globcurrent.ifremer.fr/products-data				

Operational oceanography requirements for TSCV data from space

- Are the GCOS requirements valid for TSCV for operational oceanography?
- Some suggestions for new requirements, for discussion…

	Goal	Breakthrough	Threshold	Notes
Horizontal resolution (km)	3	10	25	Global forecasting systems at 1/12° -> 1/36° (~3 km). Regional systems at ~1 km.
Temporal resolution (d)	1/4		7	G = Partially resolve high frequency processes e.g. NIO, tides. T = Resolve mesoscale evolution.
Timeliness (d)	1/4		1	Operational systems need data close to real-time for assimilation.
Measurement uncertainty (m/s)	0.02	0.1	0.2	Need to specify the time/space scales for which these apply. Hard to know existing accuracy of operational TSCV outputs given lack of global data. Use comparisons with drifters as a guide (~0.2-0.25 m/s RMSE)?

Operational oceanography requirements for TSCV data from space

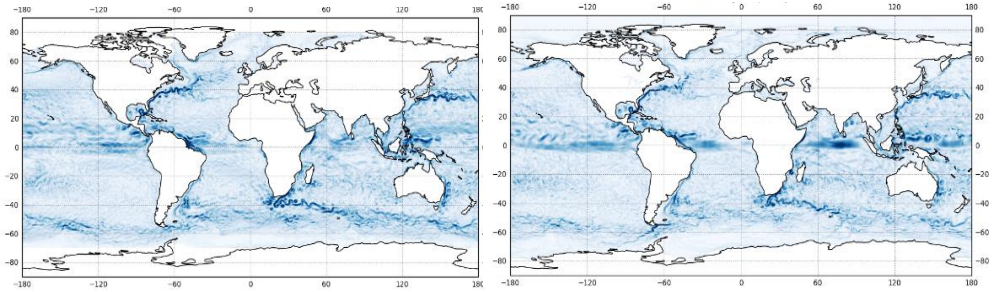
- Important regions, e.g.:
    - Near the coast where most users are.
    - Equatorial region.
    - High latitudes.
    - Western boundary currents.
    - Others?
- Estimates of the uncertainties: random uncorrelated, random correlated, bias.
- Reference observations:
    - global (even if sparse) and routine sampling by reference observations would make the satellite data even more valuable.
    - which technology could be used?

Met Office

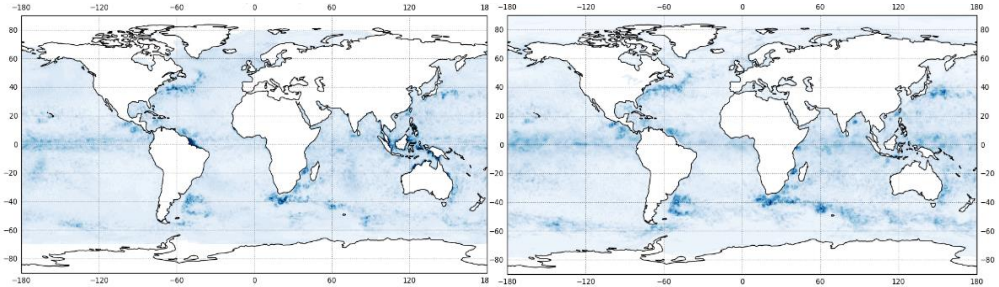
Accuracy of FOAM near-surface currents

GlobCurrent

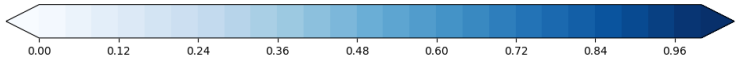
Met Office FOAM 1/4°

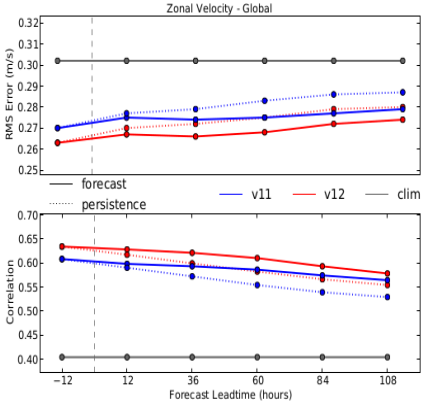


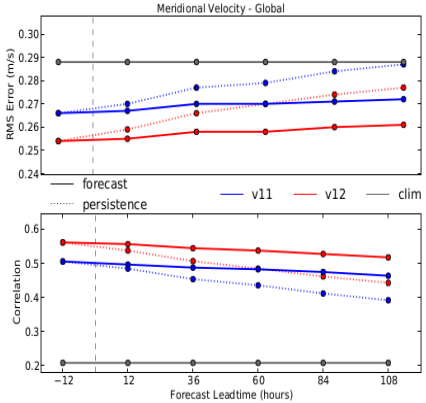
Monthly mean surface currents



Variability of the surface currents







Accuracy of FOAM 15 m depth currents compared with drifter-derived currents. From Blockley et al., 2014.
(grey line is drifter-based climatology RMSE/correlation)