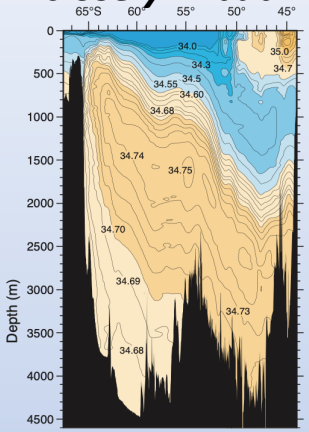
Feature Mapping: post-processing gridded products to refine ocean features

Tatiana Rykova
CSIRO Oceans and Atmosphere, Hobart, TAS, Australia

Hydrographic sections fit data closely … but models don't



→ ***Hydrographic sections often show small-scale, small-amplitude features that are important.***

→ ***Models generally show smooth fields, lacking many details, even in reanalyses.***

Figure 1: This example, along WOCE line S3 (P12) is sufficient to resolve features with local maxima of 0.01 psu at 1650 m depth and 55°S.

How closely should models "fit" observations?

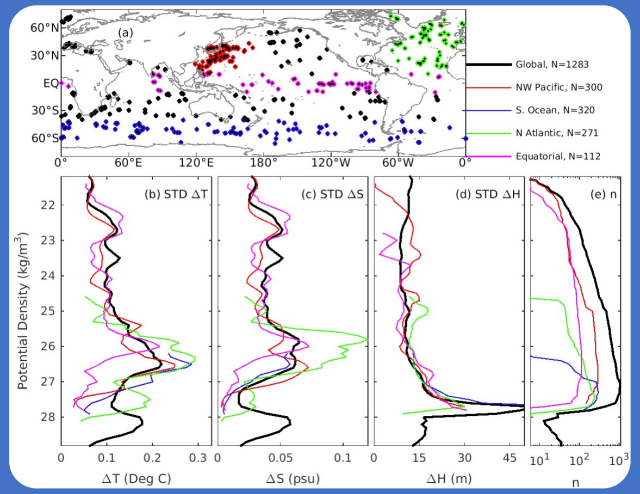
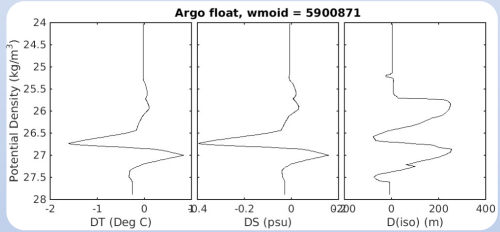


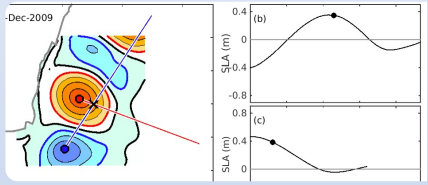
Figure 2: Argo "buddy" floats within 10 km & 12 hours, showing differences for 0.1°C, 0.04 psu, and 10 m depth (for isopycnal depths). [Colours denote regions; excludes top 50 m]

What is Feature Mapping?

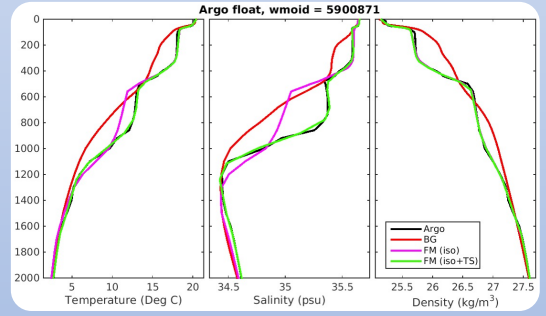
Post-processing of gridded products to adjust TS-properties and isopycnal depths … to better "fit" observations.

***Step 1**: Identify the target feature and Argo profiles within the feature.*

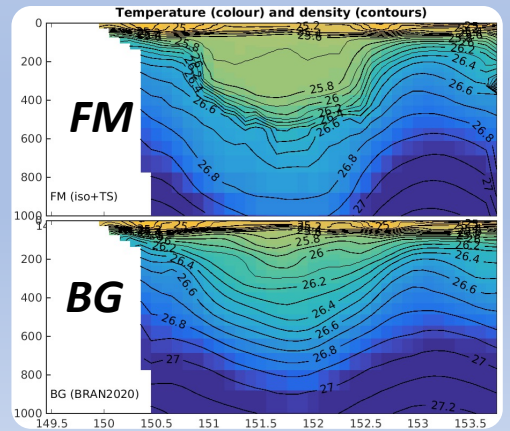




***Step 2**: Calculate the differences of temperature, salinity, and isopycnal depths in density space.*
… construct a look-up table.



***Step 3 & 4**: Adjust the TS-properties and then isopycnal depths using the look-up table for the entire feature.*
***Step 5**: Apply convective adjustment.*



Concept

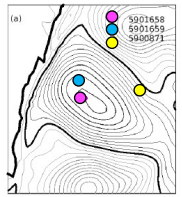
→ *Models tend to under-exploit observations, often missing key features.*

→ *Argo buddies suggest gridded fields should fit to within ~0.1°C, ~0.04 psu, isopycnal depths to within ~10 m*

→ *Feature mapping borrows ideas from weather forecasting (post-processing) to refine gridded fields.*

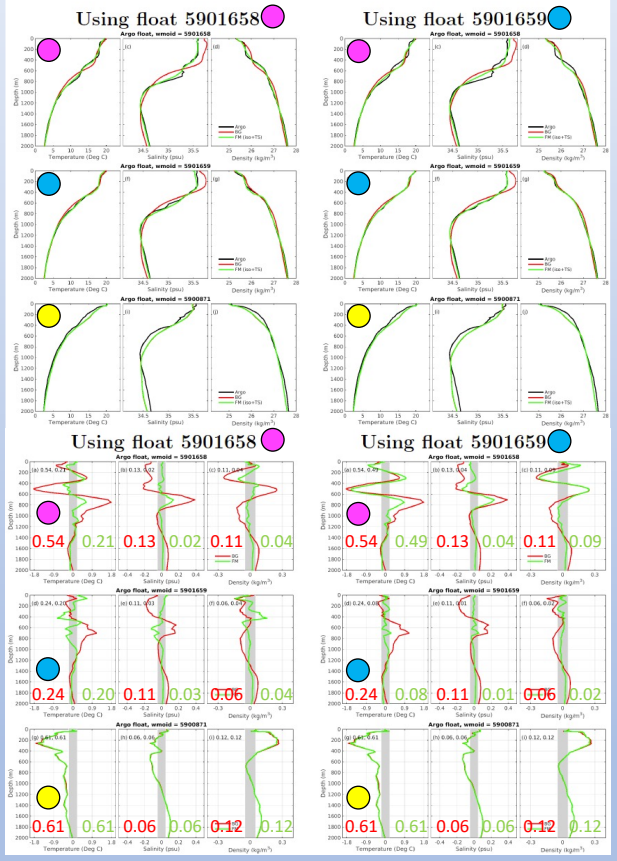
→ *Profiles can be made to fit precisely.*

Feature-mapped fields include the multiple layers, and smaller mis-fits.



Eddy with 3 floats

Argo
BG
FM



Next Steps

→ *Use multiple profiles in a single step*

→ *Produce regional and possibly global feature-mapped fields*

→ *Assess using experiments with known "true" fields.*

Contact: Tatiana.rykova@csiro.au