

# The Scottish Coastal Observatory

## ENSURING DATA QUALITY

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The Scottish Coastal Observatory (SCOs) is a network of sites around the coast of Scotland, where the physics, chemistry and biology of coastal waters are being monitored. Figure 1 shows each of our SCOs sites, and which parameters are measured where. A report providing a basic description of the seasonality and variability of the main parameters, examined between 1997 and 2013, has been published (<https://data.marine.gov.scot/dataset/scottish-coastal-observatory-1997-2013-parts-1-3>). A dataset of monthly means has also been published (doi: 10.7489/1761-1), and the high resolution SCOs datasets are currently being published (example of Stonehaven dataset, doi: 10.7489/610-1).

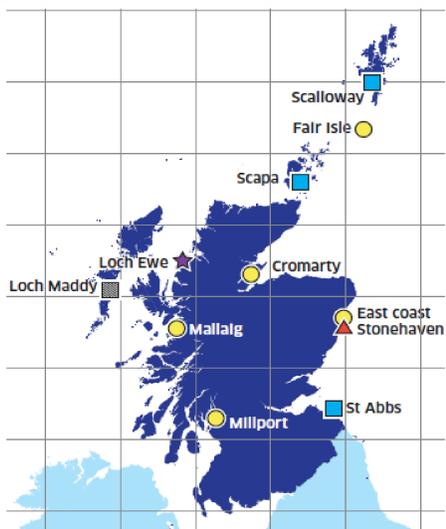


Figure 1. Map of SCOs monitoring sites, maintained by MSS and a host of volunteers

- ▲ TEMPERATURE, SALINITY, NUTRIENTS, OCEAN ACIDIFICATION, PIGMENTS, PHYTOPLANKTON, ZOOPLANKTON
- ★ TEMPERATURE, SALINITY, NUTRIENTS, PIGMENTS, PHYTOPLANKTON, ZOOPLANKTON
- TEMPERATURE, SALINITY, NUTRIENTS, PHYTOPLANKTON
- TEMPERATURE, SALINITY
- TEMPERATURE



Example monitoring stations at St Abbs (left) and Scapa (right)

### INITIAL QUALITY CONTROL

Analytical quality is ensured by accreditation under the data quality standard ISO 17025 or Joint Code of Practice.

The data quality of each SCOs parameter is assessed separately; and automatic flags are assigned to:

- All missing data (NaN values) are flagged
- All metadata are checked as being acceptable and consistent
- Duplicate pairs are checked and plotted

Flags can be applied to any measured parameter through the QC toolbox (Figure 2):

- Manually flag above/ below desired threshold, or on standard deviation
- Flag using seasonal cycle, for example, temperature is the parameter best suited to be considered within the confines of a seasonal cycle

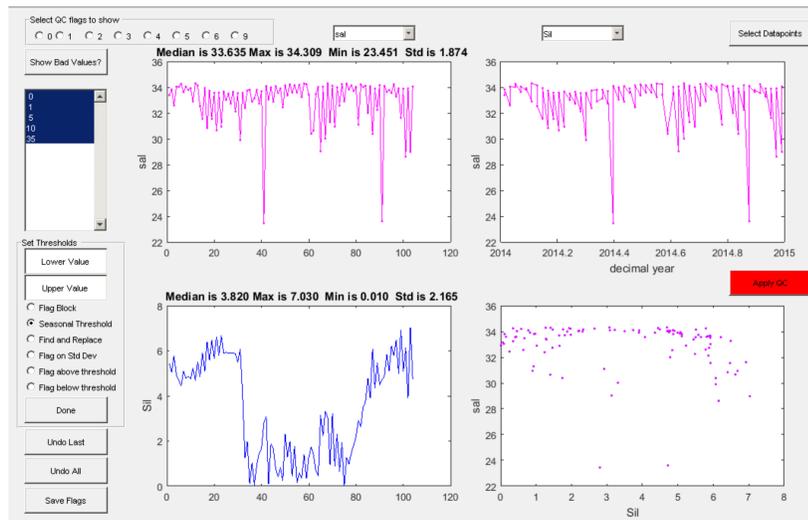
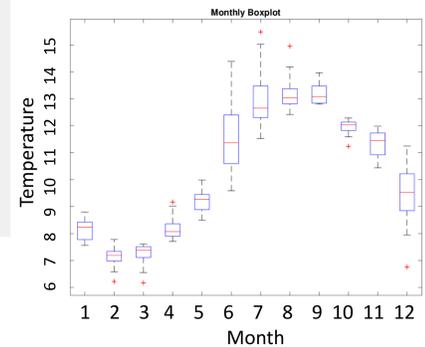
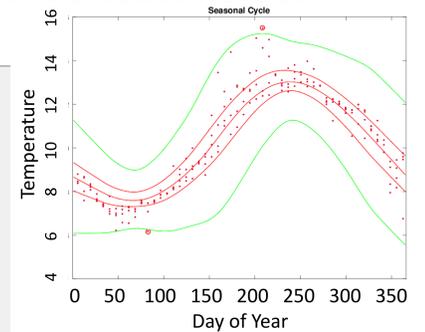


Figure 2. Quality control toolbox created in MATLAB. a) the toolbox b) and c) example of seasonal cycle temperature plots

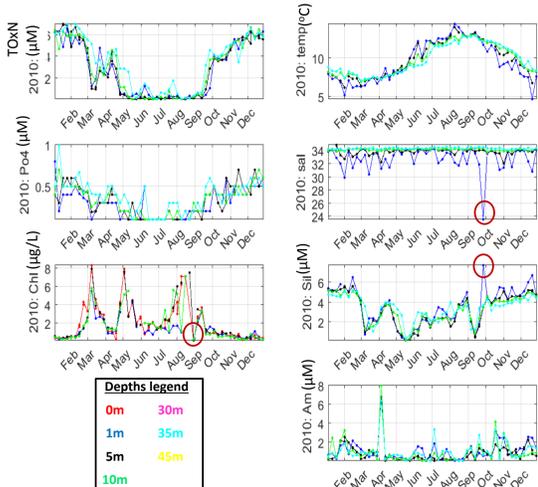


The flagging system uses the SeaDataNet QC flag scale, which evaluates the data, but no changes are made to the original data values.

### FINAL QUALITY CONTROL

Once flags have been assigned using the QC tool (Figure 2), plots are created (examples shown in Figures 3 and 4) of each parameter by station and by year, with their associated flag. A QC team combining oceanographic, chemical and biological expertise then assess each flag and confirm, or edit, depending on what can be deduced from evaluating all parameters together

#### LOCH EWE



In Loch Ewe, where parameters are measured at multiple depths, the decrease in salinity at 1 m corresponds with a peak in Dissolved Silicate concentration at 1 m, and a drop in the 10m integrated Chlorophyll concentration, all flagged as 'good' data points, and can be attributed to freshwater input.

In Scapa freshwater influxes shown by drops in salinity, correspond with peaks in Total Oxidised Nitrogen and Dissolved Silicate concentrations, therefore allowing these data points to be confirmed as 'good'. Note that not all dips in salinity have the same effect on the nutrients (June)

#### SCAPA

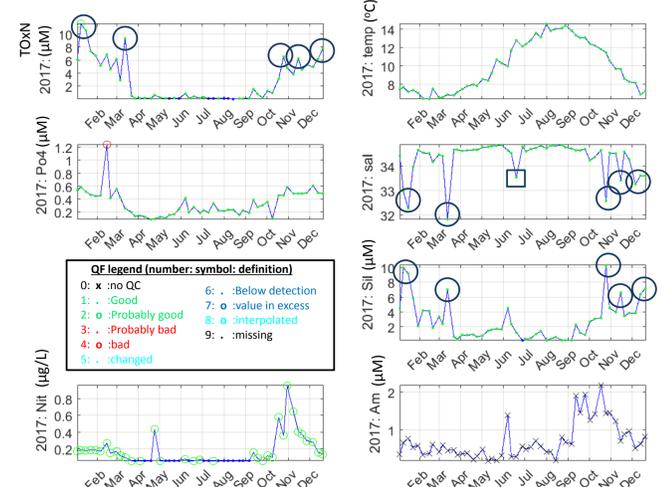


Figure 4. Quality control plots at Scapa in 2017, showing quality flags assigned to each data point

### CONCLUSIONS

The quality controlled SCOs dataset is being used to fulfil the monitoring requirements of the Marine Strategy Framework Directive, the Water Framework Directive and national Scottish requirements, and are freely available to the public. The SCOs dataset will also contribute to the Interreg Atlantic Area MyCoast project (EAPA 285/2016), which aims to harmonise coastal monitoring programmes across the European Atlantic Area and apply common coastal risk management tools.

Acknowledgements: The authors wish to acknowledge the contribution of the many people (volunteers, analysts, administrators) involved in the successful delivery of the SCOs programme. Without their contribution this programme of work would not be feasible