



## GCOS Network Monitoring

### Examples of recent performance monitoring statistics for climate observations.



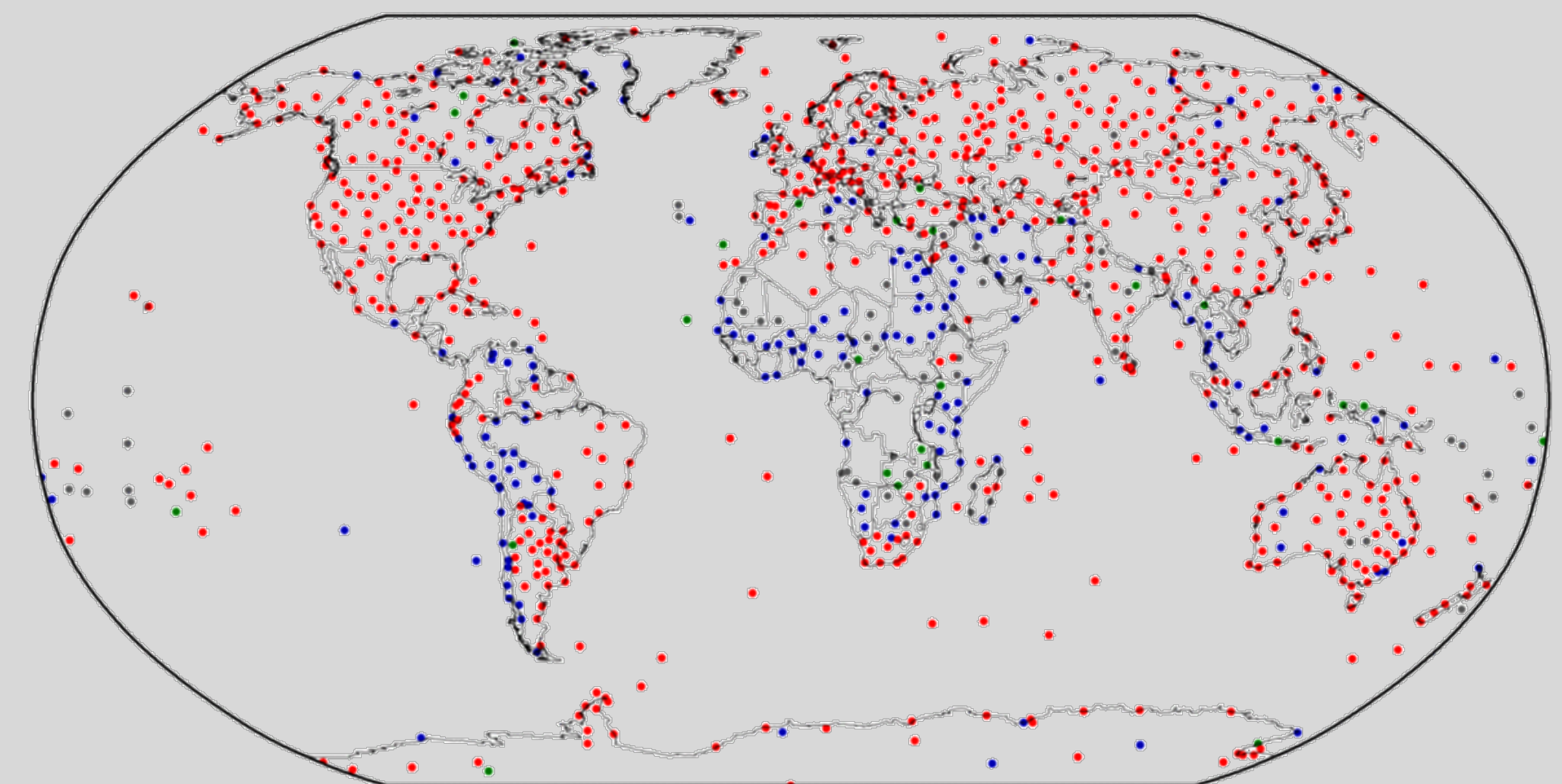
#### GCOS Surface Network (1017 Stations)

The GCOS Surface Network (GSN) is intended to comprise the best possible set of land stations with a spacing of 2.5 to 5 degrees of latitude, thereby allowing coarse-mesh horizontal analyses for some basic parameters (primarily Temperature and Precipitation). The criteria for selection include:

- Commitments by NMHSs with regard to continuity;
- Geographical representativeness of observations;
- Length and quality of historical time series;
- Available parameters.

Plot right is from the National Centre for Environmental Information (NCEI), in the US. It shows the number of monthly CLIMAT reports which were received from each GSN over the period July 2015 to June 2016 (minimum requirement is 12).

GSN, No. months reporting (201507 to 201606), RED=12, BLUE=6 to 11, GREEN=1 to 5, GRAY=0



#### GCOS Upper-Air Network (171 Stations)

The GCOS Upper-Air Network (GUAN) was designed with a spacing of around 5 to 10 degrees latitude, sufficient to resolve synoptic-scale waves. The desired parameters are temperature, pressure (geopotential height), wind, and humidity (at least in the troposphere). The inclusion criteria are:

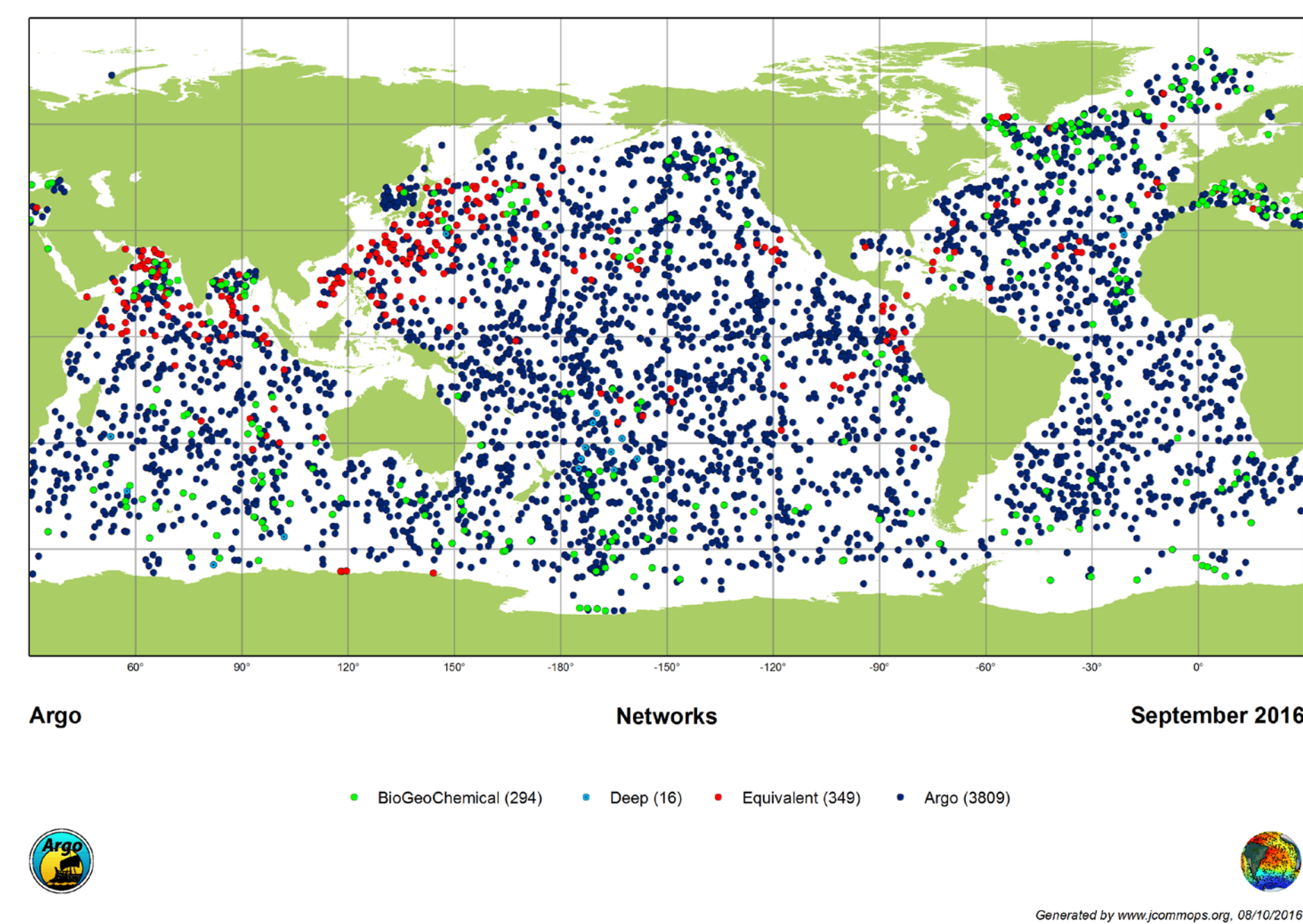
- Commitment by NMHSs with regard to continuity;
- Length and quality of historical time series;
- Current measurement quality.

Plot right is based on Statistics from the National Centre for Environmental Prediction (NCEP), in the US. Stations marked as green are meeting or exceeding the requirement of 25 daily soundings per month to a height of 30hPa.

2015 Performance (NCEP):

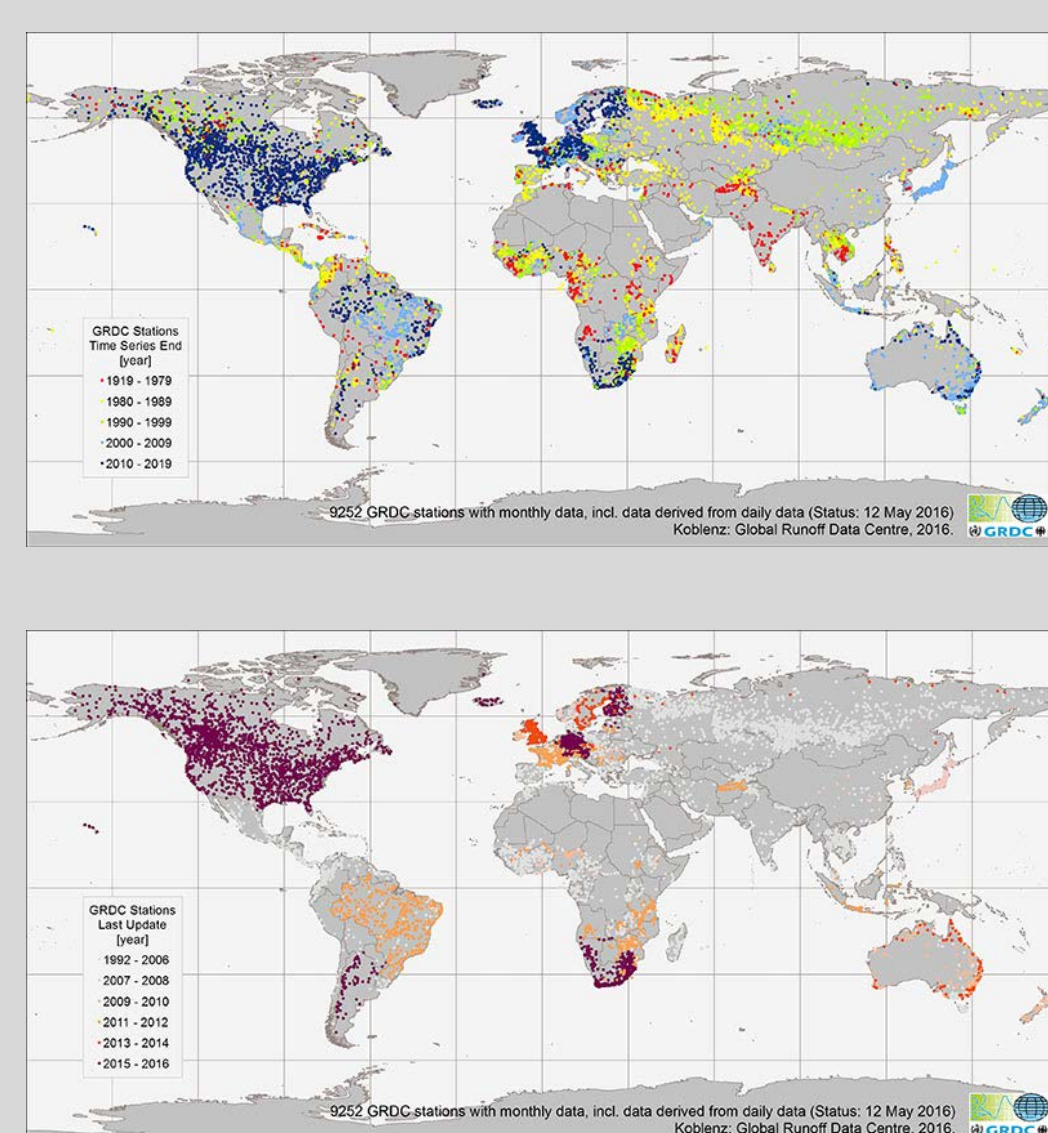
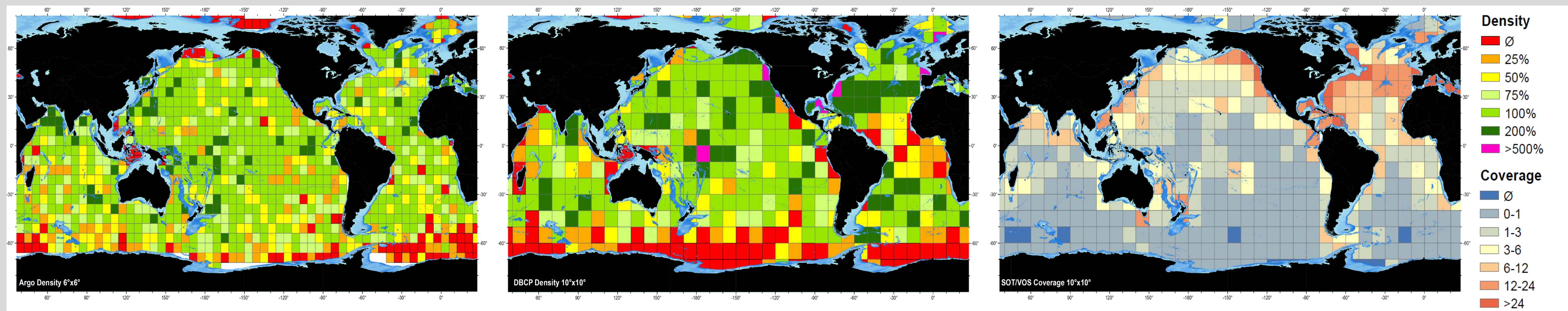
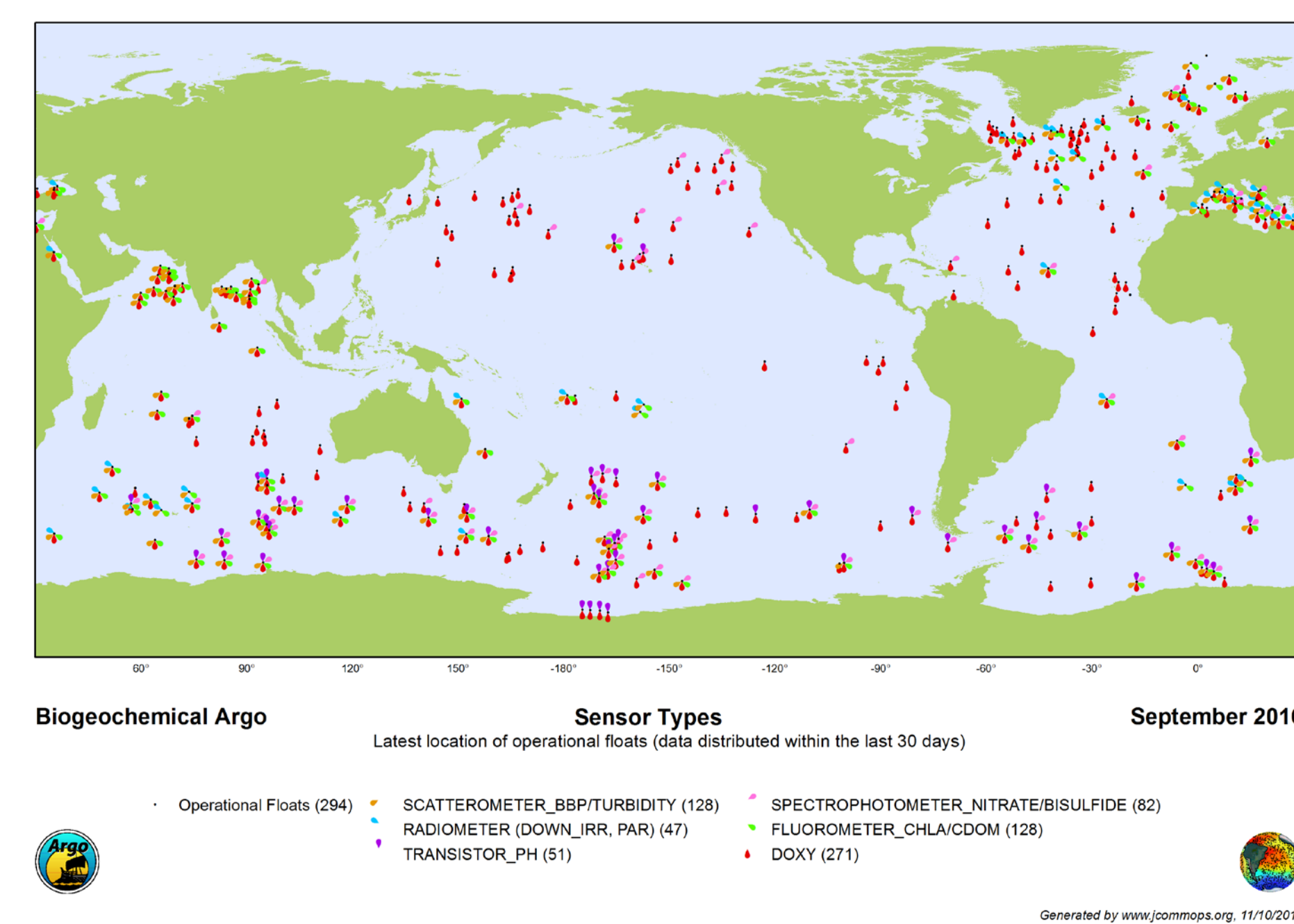
- Met minimum requirements.
- Marginal performance.
- Poor performance.
- No observations

#### GCOS Upper-Air Network (171 Stations)



Ocean observations have made large strides in recent years. The development of the system of ARGO buoys (left) measuring the temperature and salinity of the upper 2000 m of the ocean have largely achieved a global coverage, however there remain areas where coverage is less ideal (below left). These buoys are being developed to measure a range of additional parameters such as oxygen, nitrate, chlorophyll and particulates (right).

The performance of the ARGO system and other ocean networks is monitored by JCOMMOPS, sponsored by WMO and IOC. JCOMMOPS also monitors other systems such as those of the Data Buoy Cooperation Panel (DBCP, below centre) measuring atmospheric and oceanographic conditions, and the JCOMM Voluntary Observing Ship Scheme (VOS) the JCOMM Ship Observations Team (SOT) with ship borne observations (below right).



Terrestrial observations are more diverse and less well coordinated. Traditionally performed nationally without global coordination. WMO does coordinate hydrological observations and is now working on improving the reporting of river observations (right).

In some areas, such as permafrost coordinated through the Global terrestrial Network – Permafrost (GTN-P) standardisation and the establishment of centralised datasets is being achieved (far-right). WMO's Global Cryosphere Watch will extend this to all snow and ice observations. For other Essential Climate variables, satellite based products, with ground based validation is achieving a global coverage (right) and ensuring these products are calibrated and consistent is a task in the latest GCOS Implementation Plan.

