WP5: Detecting spatial & temporal patterns

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WP5: Detecting spatial & temporal patterns

**Aim:**
To assess the extent of temporal coherence for individual remotely-sensed lake characteristics & to define the nature of any clusters of coherent lakes.

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**Inputs:** EO data products from WPs 1,2 and 3.

**Outputs:** Temporal patterns and clusters of lakes for WPs 6 and 7
Temporal coherence

• The degree to which different lakes behave similarly through time.

• Understanding the spatial extent of coherence for different lake characteristics is a valuable tool to extrapolate from measured to unmeasured lakes.

• Access to 1000 long-term datasets will enable assessment of the degree of change in the coherence of seasonal patterns for lakes globally.
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Objectives

5.1 Assess the present state & evidence for long-term change in the 1000 lakes.

5.2 Identify patterns of temporal coherence for individual remotely sensed lake characteristics & the spatial extent of coherence.

5.3 Identify phenological patterns of change in remotely sensed lake characteristics.
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Implementation

June 2014 - September 2017

PDRA in Statistics at Glasgow University to be appointed from Sept 2013.

*Develop and apply statistical models to the remotely sensed observations of lake characteristics to deliver temporal pattern analysis and spatial clustering.*

Here are some example analyses for each work package deliverable.
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D5.1/5.2 Assess the present state & identify long-term patterns of change in global lakes.

Log chlorophyll at Loch Leven

Examples:

- Long-term trends for each season
- Long-term trend and seasonal patterns
- Changes in seasonality over time

Long-term trend in Spring log chlorophyll.
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D5.1/5.2 Assess the present state & identify long-term patterns of change in global lakes.

Log chlorophyll, long-term trend with variability band

Log chlorophyll, seasonal pattern with variability band
Identify phenological patterns of change in remotely sensed lake characteristics.

Ferguson et al. (2008), Carvalho et al. (2012)
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D5.3/5.4 Identification of patterns of coherence, clusters of common signals and non-conforming lakes

Statistical techniques include:

- Dynamic Factor Analysis
- Functional Data Analysis
- State space model for clustering, Finazzi et. al (2012)

TOC fitted curves for 15 lake sites. Two common trends identified. Reid (2012)
D5.3/5.4 Identification of patterns of coherence, clusters of common signals and non conforming lakes

Clustering Scottish lakes using chlorophyll

Haggarty et. al (2012), Environmetrics
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Work Package Challenges

• Obtaining an appropriate length of time series to enable identification of patterns of change.

• Data resolution – comparing different levels of spatial and temporal data.

• Computational challenges with modelling and clustering data from 1000 lakes.
References


