

# A wavelet approach for estimating Chl-a from inland waters with reflectance spectroscopy

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Can we use remote sensing to estimate water quality?

Optically active constituents influence upwelling light

Inland waters are a challenge

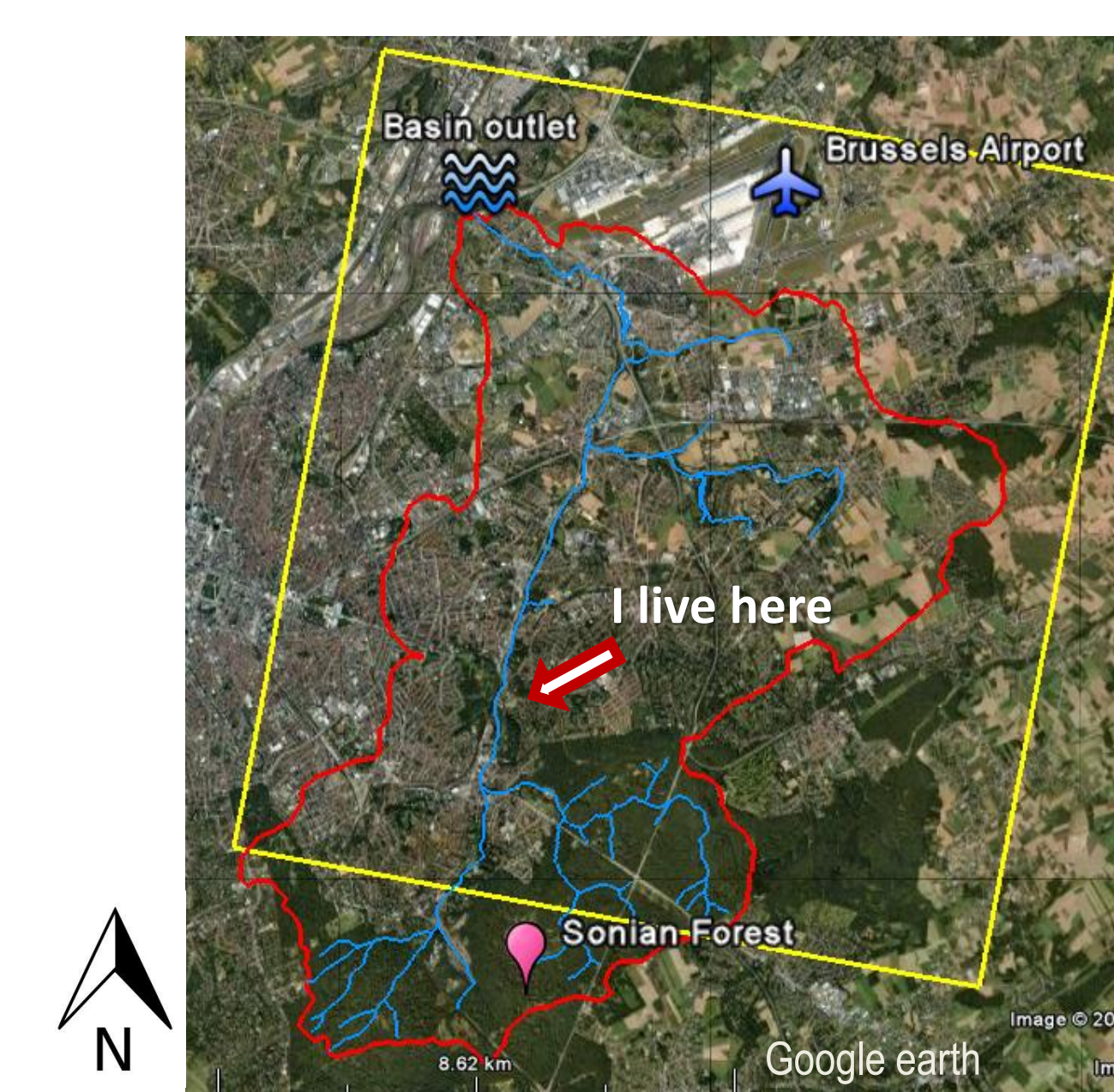
Chl-a feature detection may be impeded by the combined influence of other optically active constituents

Chl-a spectral absorption features vary

Can we benefit from the signal shape?

Study site: 21 artificial shallow ponds in Brussels, Belgium

Chl-a concentration: 2 - 478  $\mu\text{g/l}$



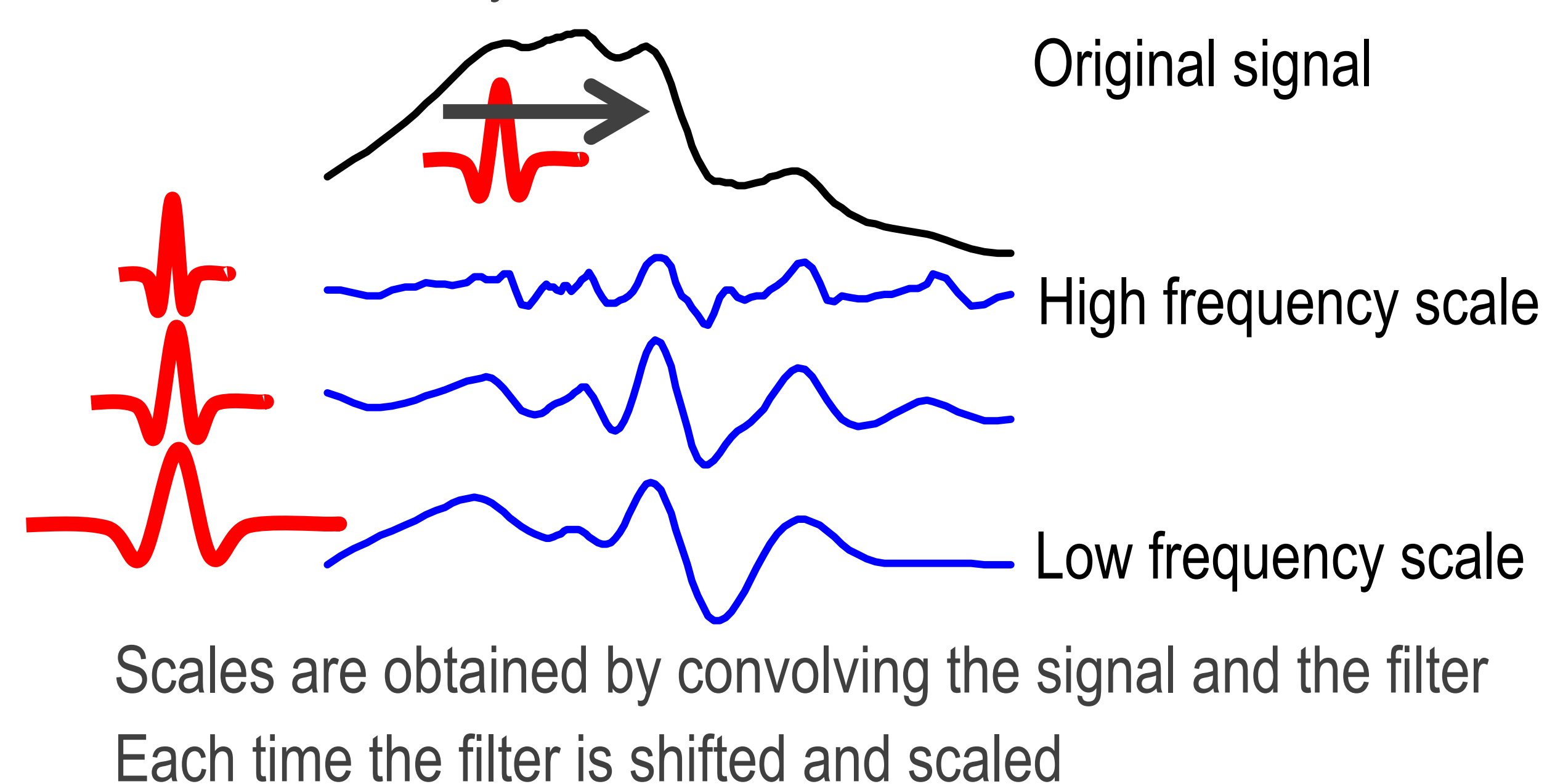
The continuous wavelet decomposes the signal in multiple frequency scales

Band pass filters that return localized information

Wavelet decomposition enhances extraction of information

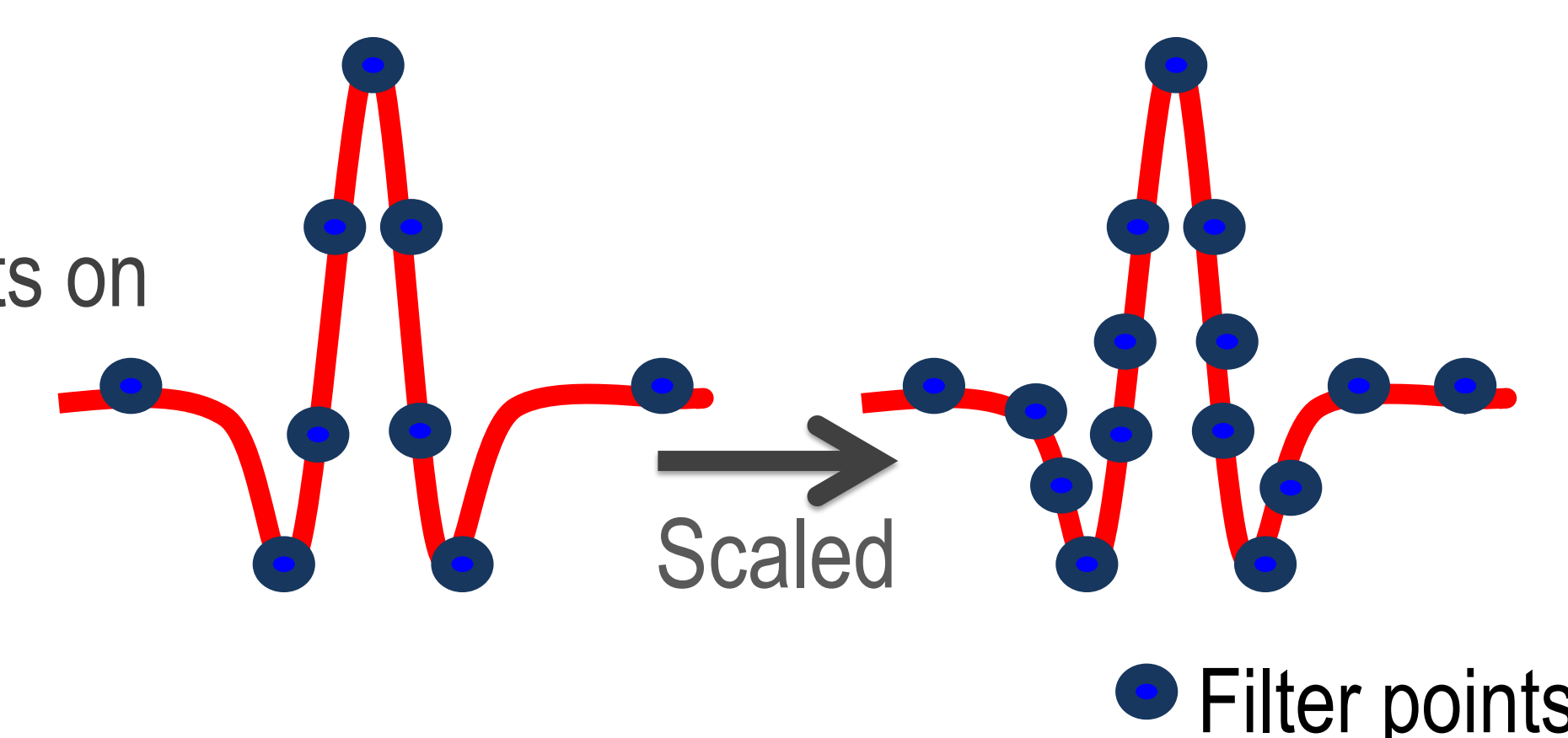
Wavelets synthesize information across wavebands

Reduced sensitivity to noise



Mexican hat wavelet

Filter is scaled by adding points on the Mexican hat function

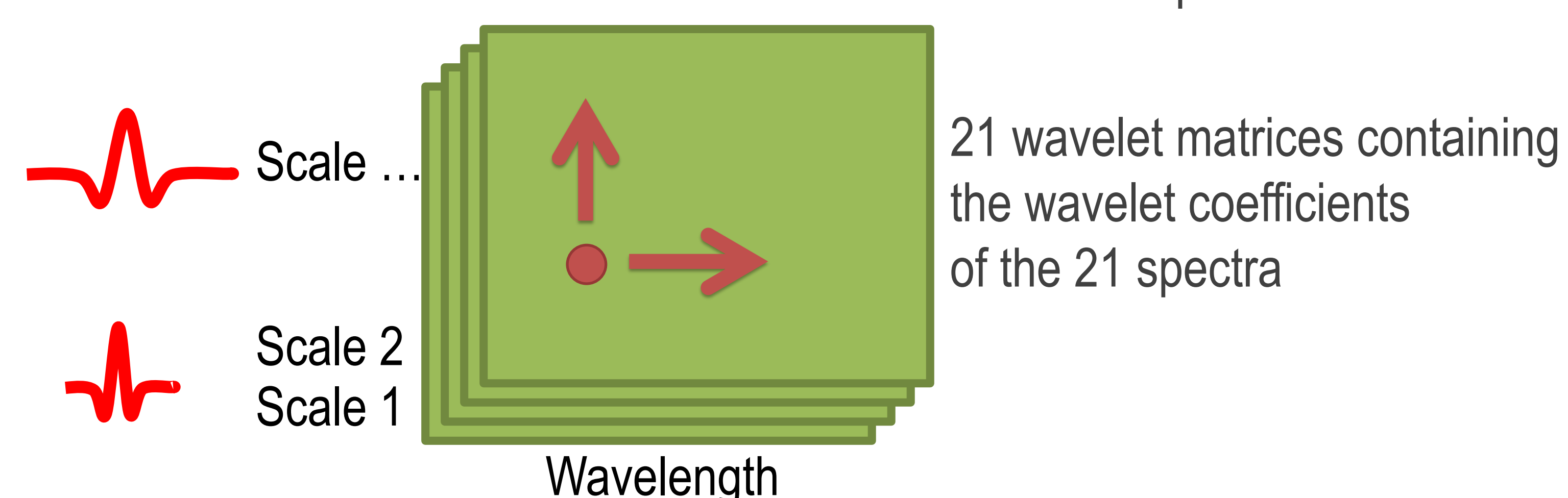


2D correlation scalogram

Each scale is a different representation of the signal

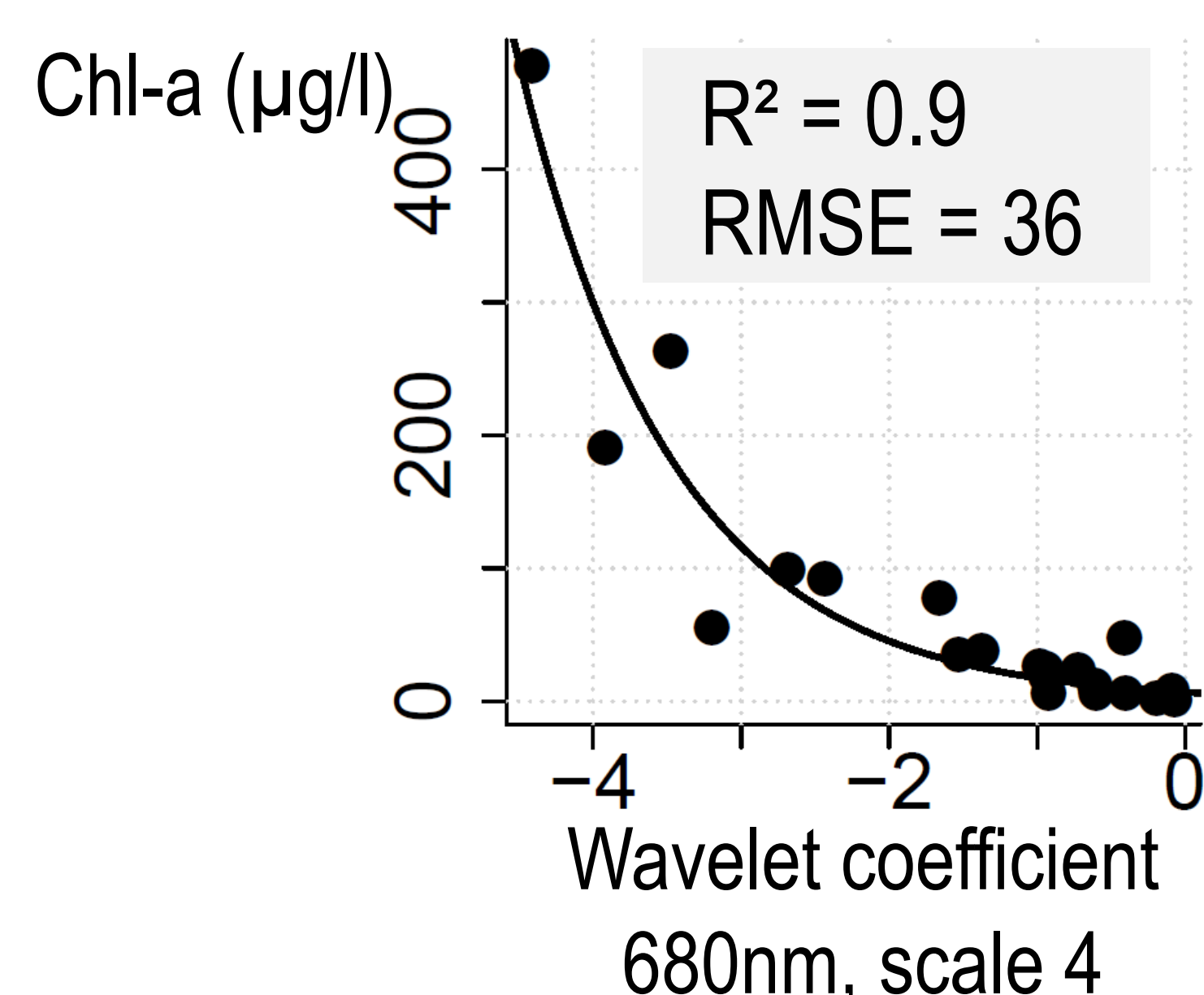
We use the wavelet coefficients to estimate Chl-a from the signal

For each wavelength and scale we calculate the correlation between the wavelet coefficients and the Chl-a concentration at each pond



The optimal wavelet feature is used in an exponential regression

This feature is diagnostic of Chl-a absorption and the second reflectance peak around 710 nm



We can now simultaneously assess narrow and broad Chl-a reflectance features

Scalogram shows where the Chl-a features are located, and at which wavelet scale

Features are related to absorption & scattering of Chl-a and the confounding factors

