Gijon, May 19-23, 2008

International Symposium on the Effects of Climate Change on the World's Oceans

W1 *Zooplankton and climate: response modes and linkages among regions, regimes, and trophic levels*

Retrospective analysis of zooplankton decadal time series in the Mediterranean Sea using an automated imaging system

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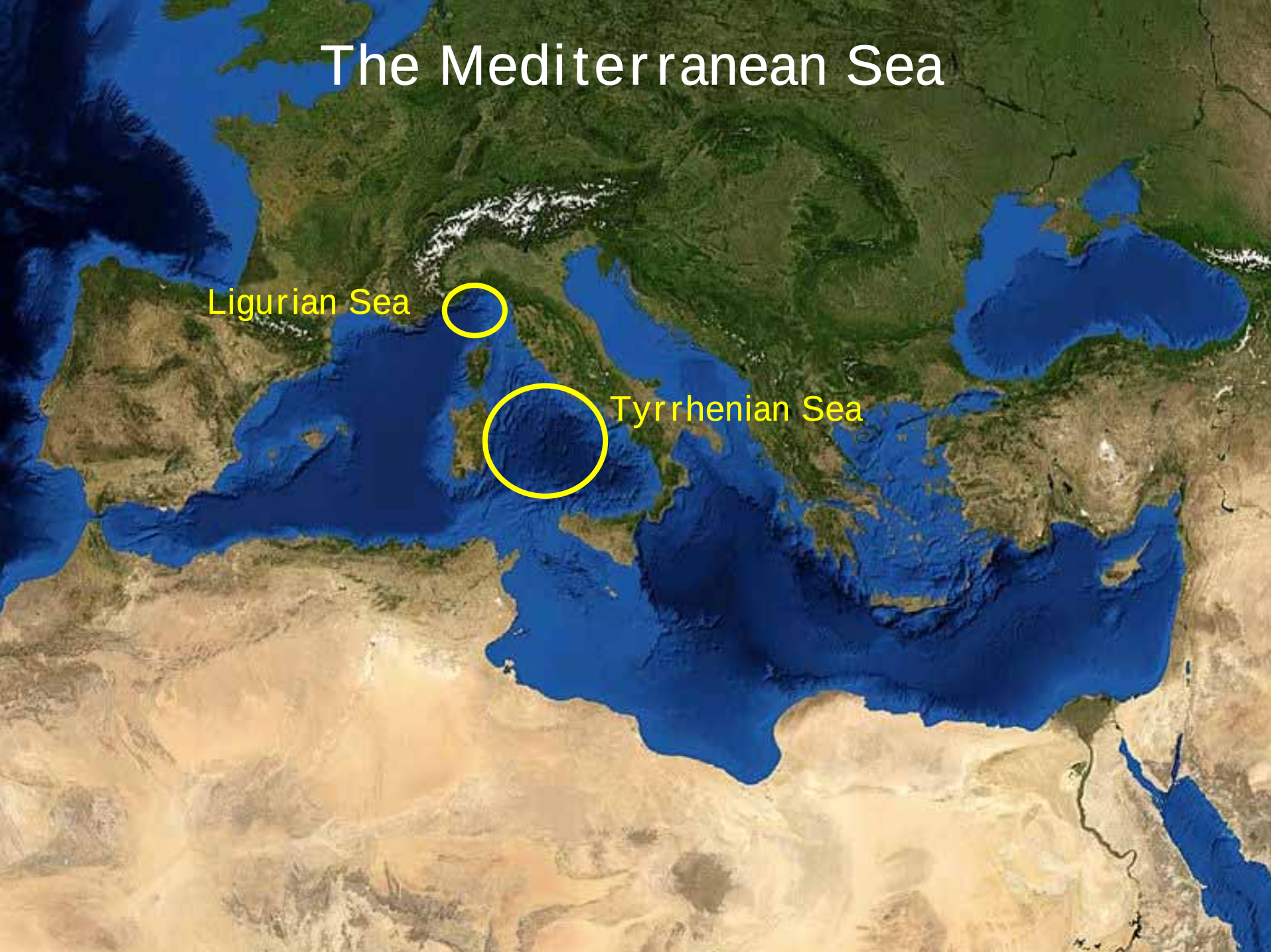
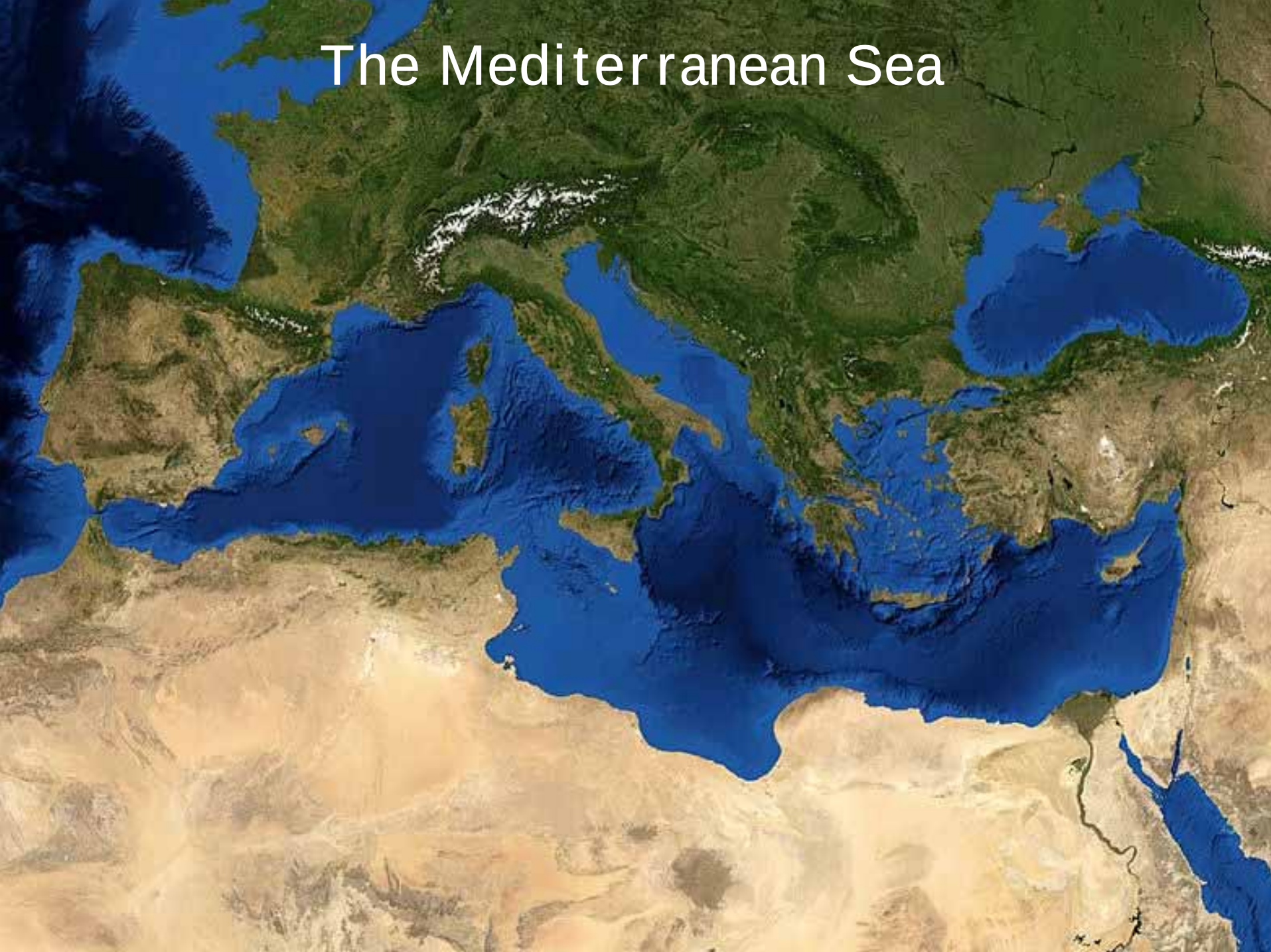
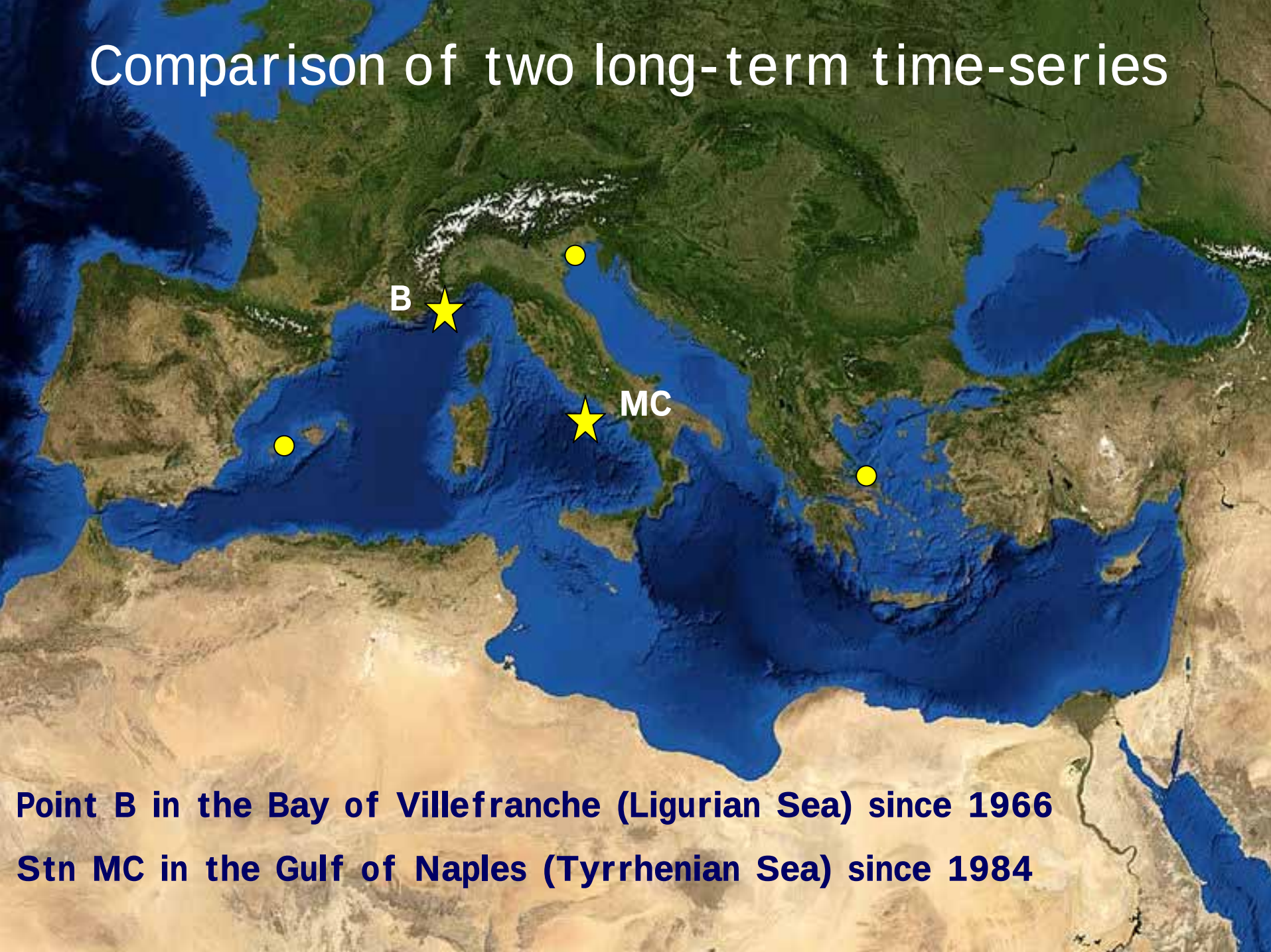

The Mediterranean Sea
Ligurian Sea
Tyrrhenian Sea


The Mediterranean Sea

Comparison of two long-term time-series



Point B in the Bay of Villefranche (Ligurian Sea) since 1966

Stn MC in the Gulf of Naples (Tyrrhenian Sea) since 1984

Bay of Villefranche

Gulf of Naples

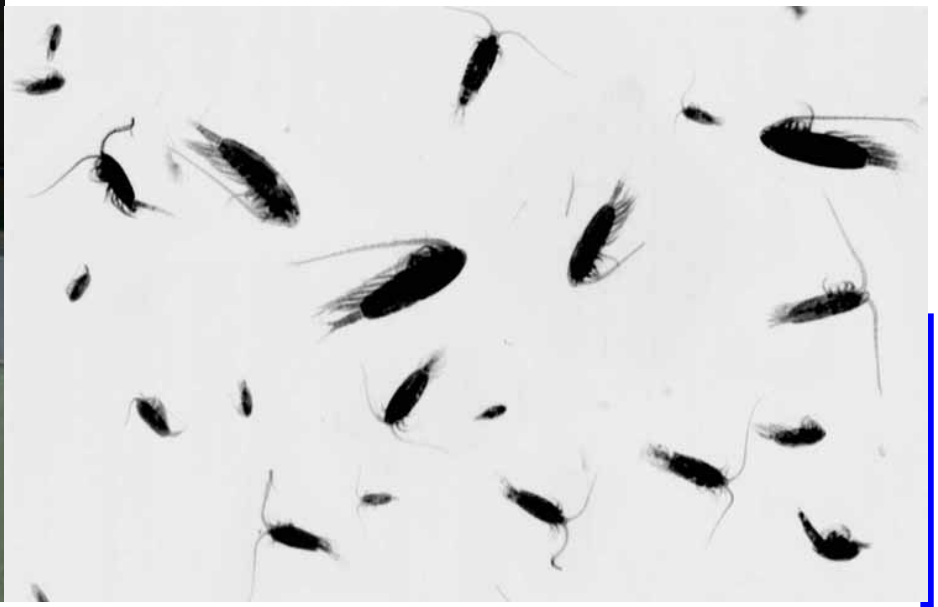
The comparison of the two time-series is based on re-analysis of samples using a digital imaging system

The Zooscan

- 12 parameters for the grey level and 7 for the position
- 10 parameters for size and 6 for shape
- ZooProcess and Plankton Identifier softwares for image processing and identification

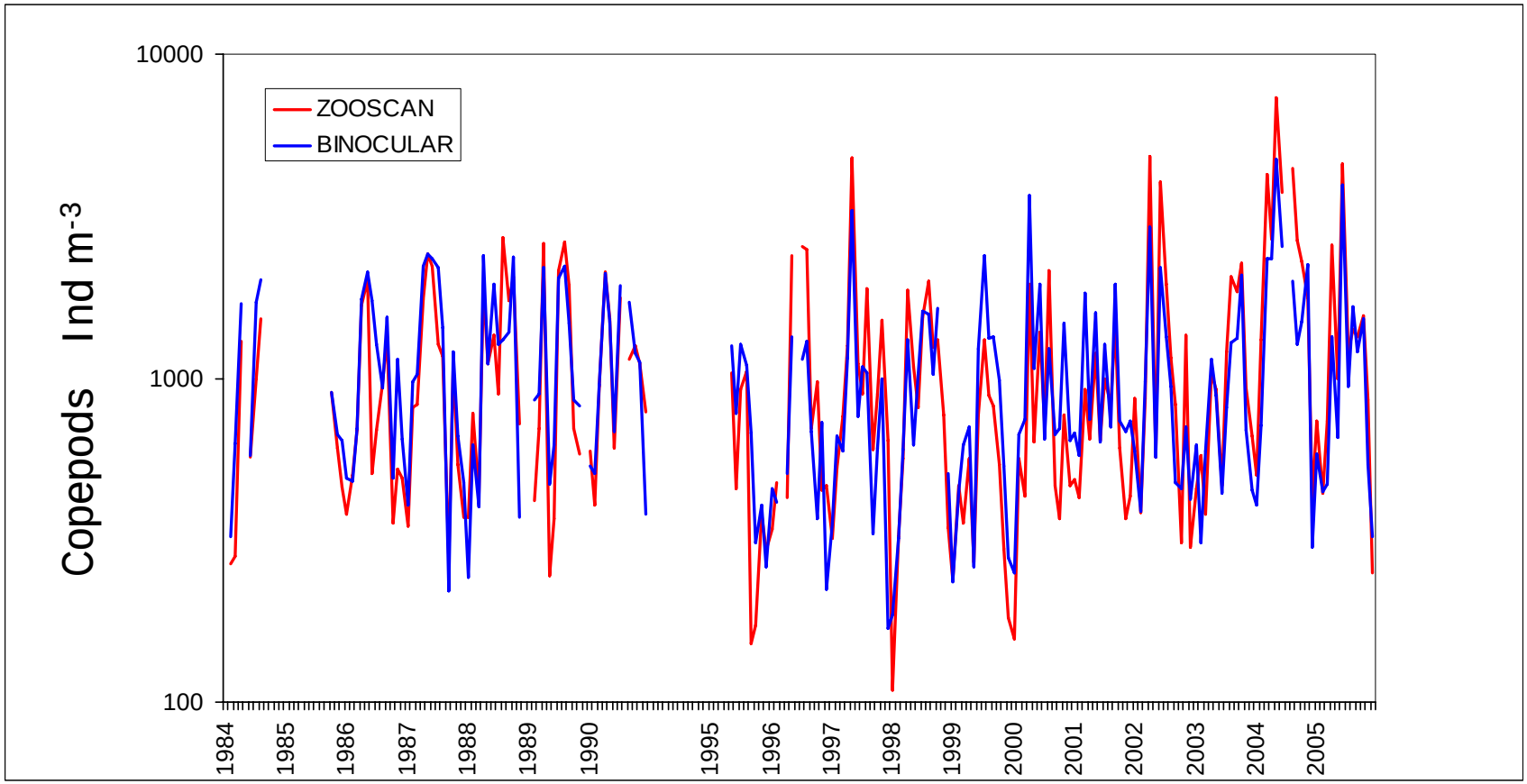
Comparison based on copepod abundance and size distribution

The Zooscan

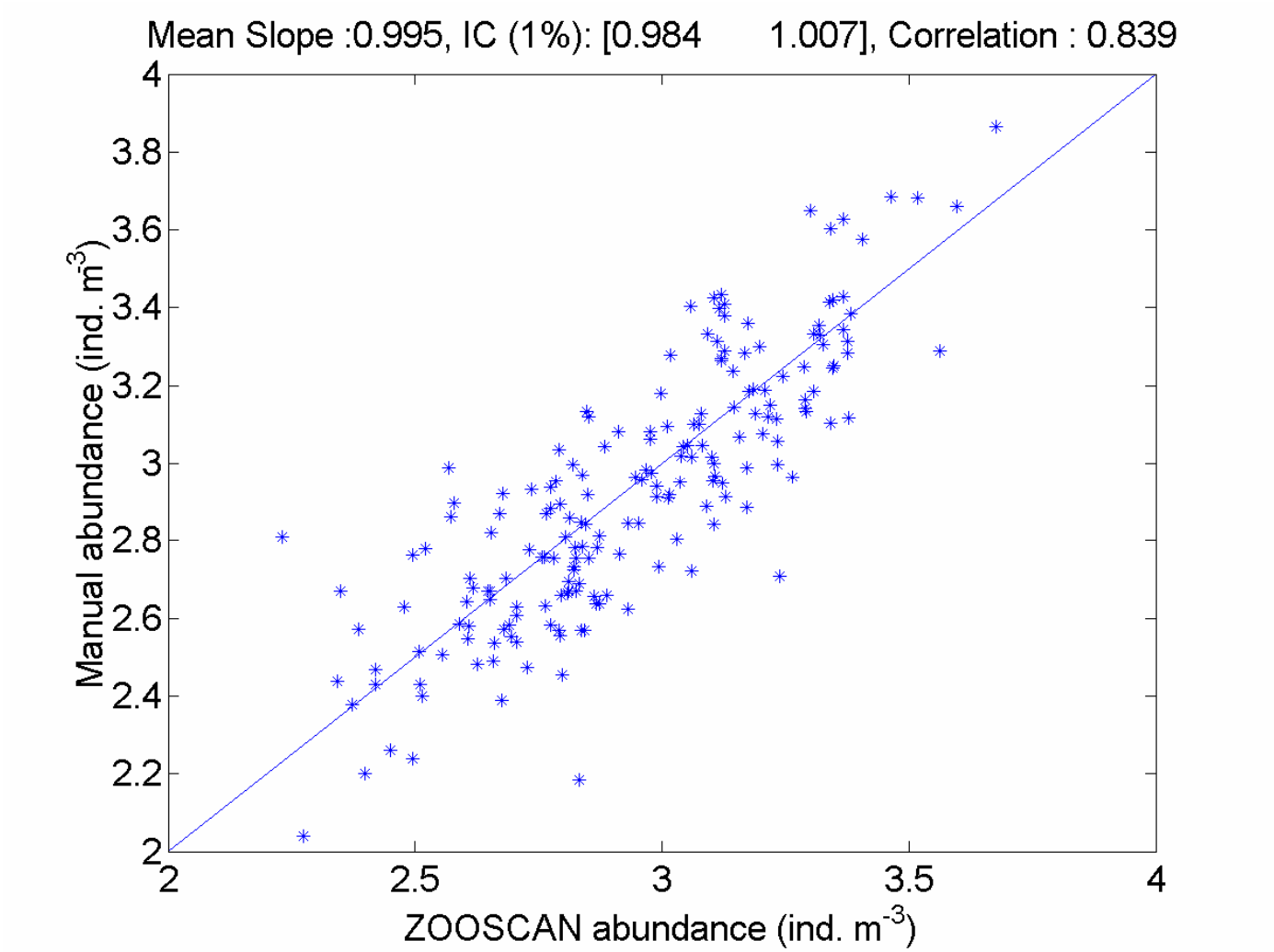


COPEPODS: 96% recognition (17% contamination)

Automatic and Manual count comparison (MC time series)



Automatic and Manual count comparison (MC time series)



Why size ?

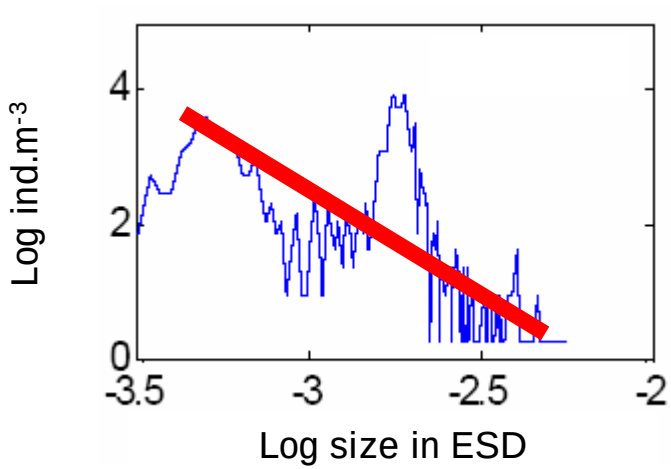
- Aggregation criterion and scaling factor
- Simplifying approach for the whole community
- Complementary to the species-level approach
- Determinant of various rate processes
- Related to prey and predator interactions and energy flow

Indicators of the shape of the size spectra

Slope of the spectra

(Platt et Denman, 1977, 1978)

- Log-Log transformation
- Linear regression



Bias due to modes

Shannon index from the spectra

(Parson, 1969; Ruiz, 1994)

Size class

Samples

Shannon (H')

(1 size class = 1 species)

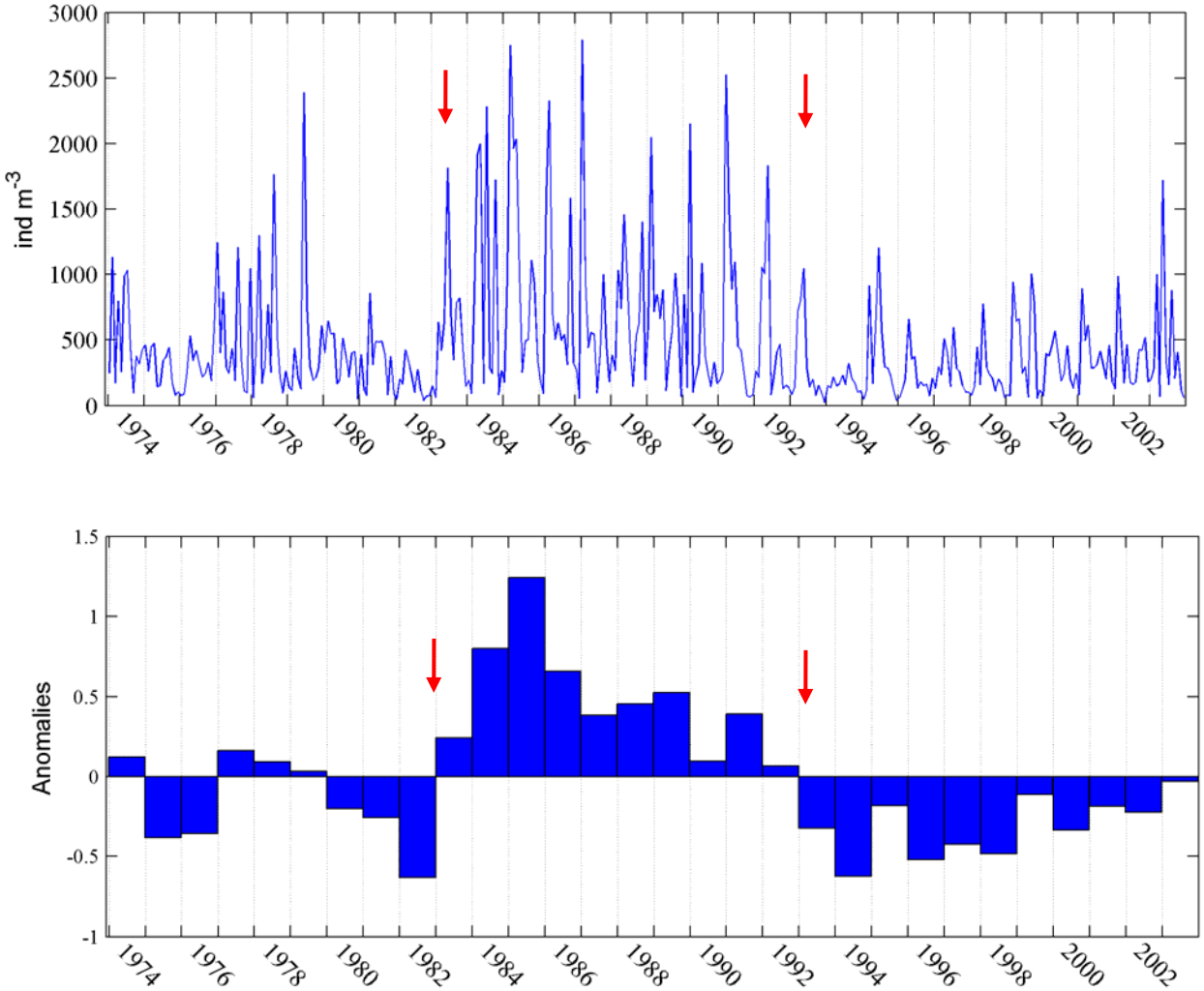
$$H' = -\sum p_i \log_2 p_i$$

Equitability, Piélou (J)

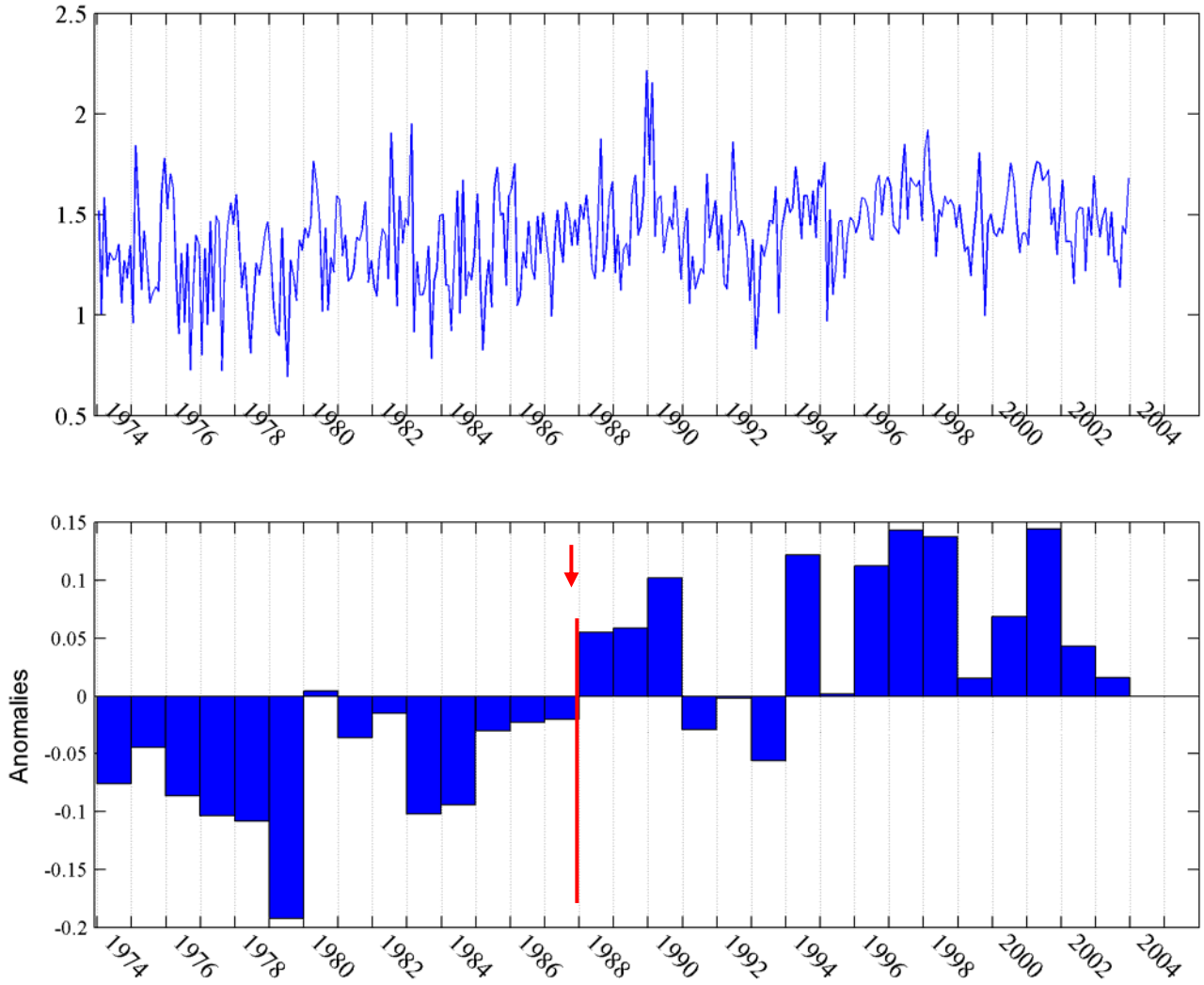
$$J = H' / \log_2 S$$

We chose this metric because of less bias due to the position of the modes

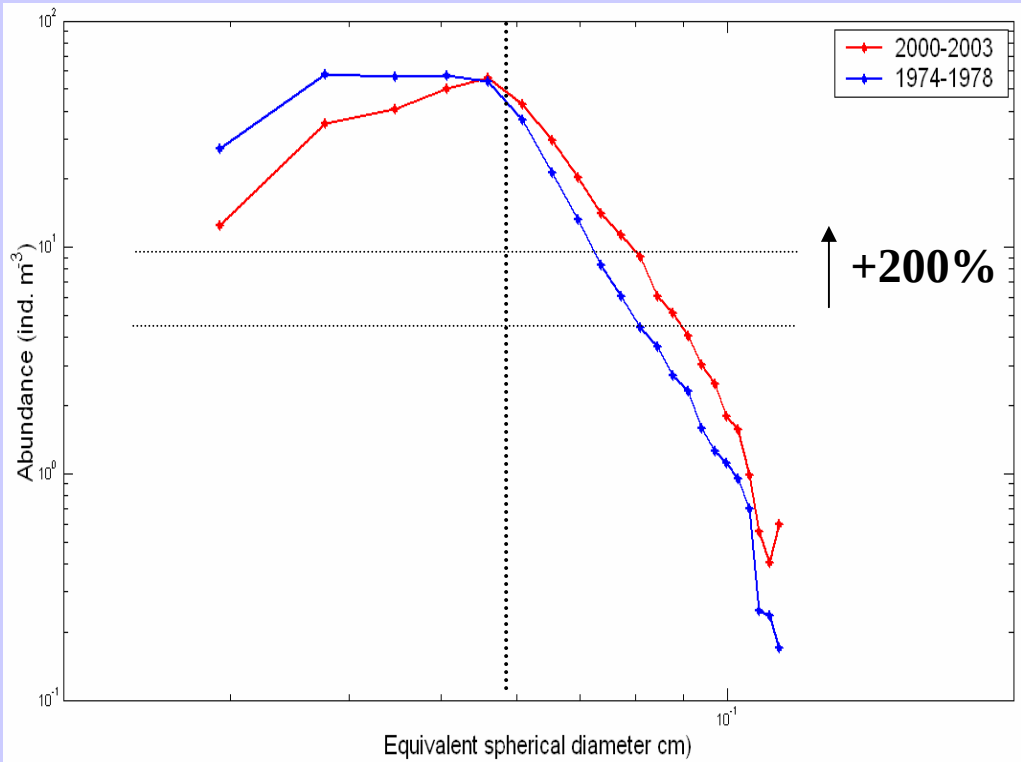
Villefranche - Long term changes (copepod abundances)



Villefranche - Long term changes (length spectra Shannon index)

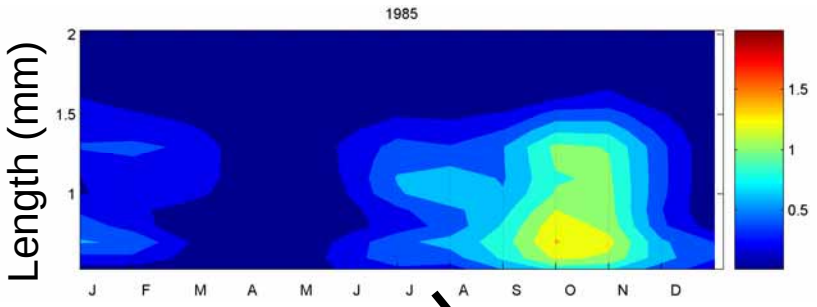


Villefranche – Size diversity

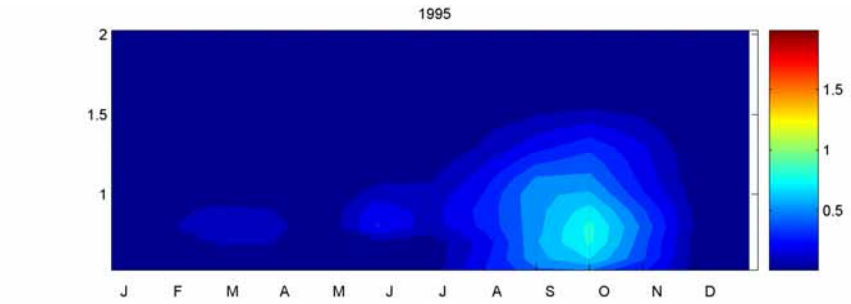


Villefranche - Phenological changes

Temora abundance spectra

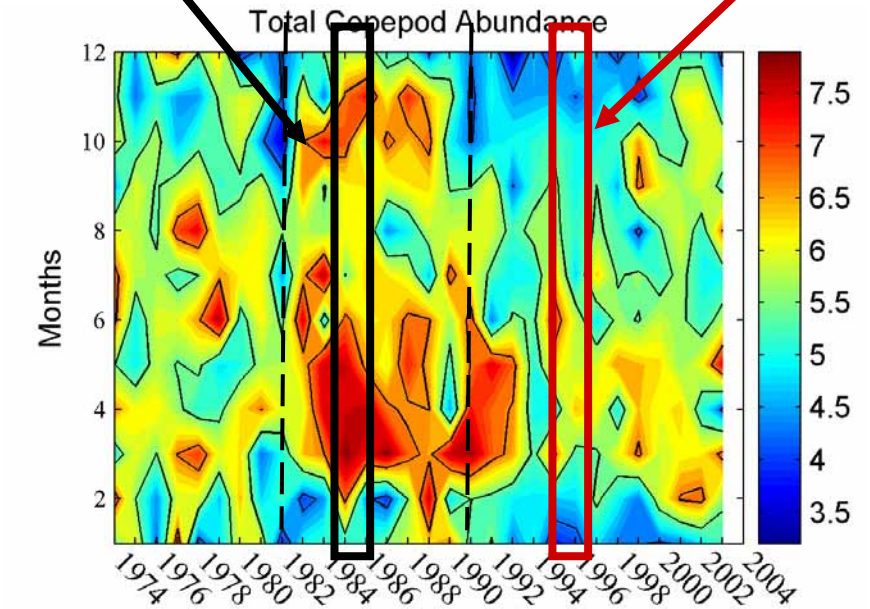


1985



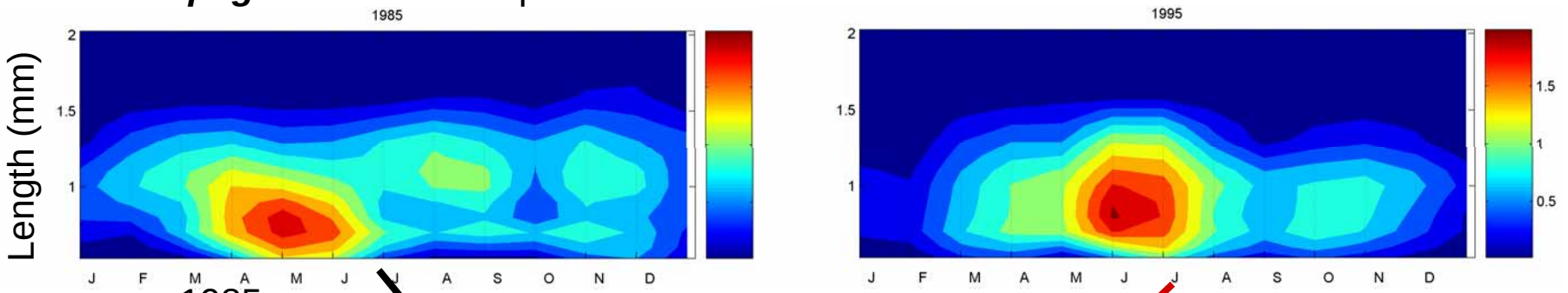
1995

Autumn peak



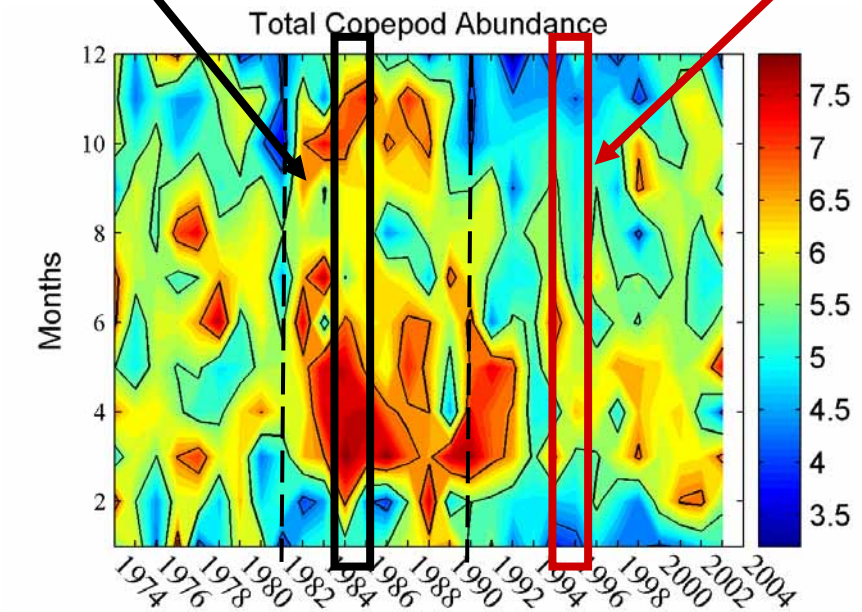
Villefranche - Phenological changes

Centropages abundance spectra



1985

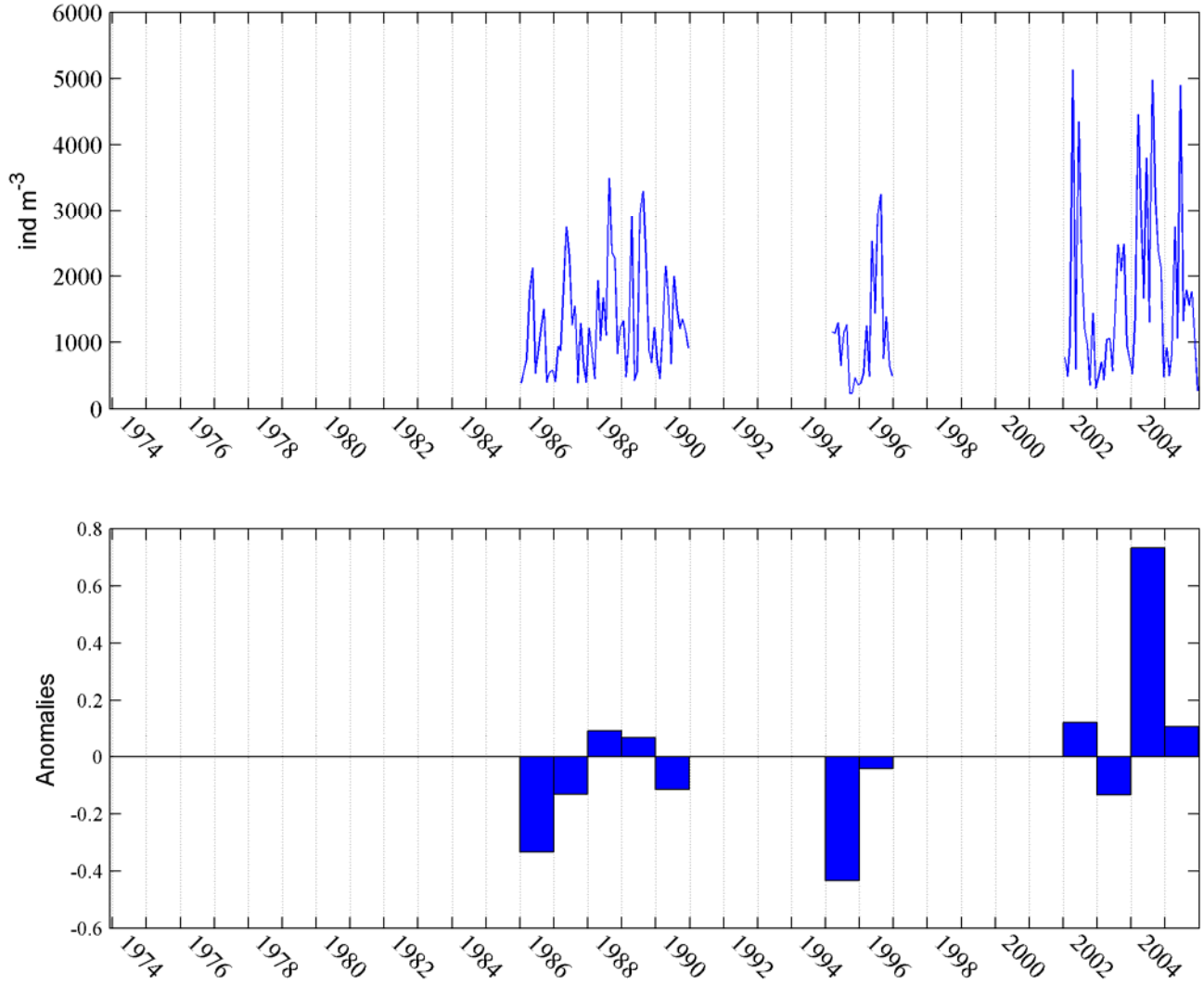
1995



Spring peak

Naples - Long term changes (copepod abundances)

!! *under construction* !!



About the automatic imaging devices

✓ Rescue of historical samples

✓ Sample treatment

SCOR WG 130

Automatic Visual Identification of Plankton

Remarks

- In Villefranche, significant changes have occurred in the total abundance and average size of copepods. It seems that a shift occurred toward larger copepod size but this has not been explained yet (probably due to change in wind regime). Inter-annual changes in the phenology could reflect changes of species occurrences.

- Current analyses are focused on comparison of the long term changes of copepod size spectra in both time series; what changes in the community do they reflect? Are they synchron? Are they linked to regional or basin-scale changes?

- Semiautomatic recognition of all large copepods to validate the datasets and test some hypotheses (e.g., the intrusion of offshore species in Villefranche).

- Utility and advantages of automatic imaging devices for the future of studies on zooplankton ecology (lab & *in situ*).