

# PSHA Workshop

## Recurrence interval for great earthquakes in mainland Portugal: a critical overview

A. Carvalho<sup>1,2</sup> and N. Malfeito<sup>2</sup>

1 – Laboratório Nacional de Engenharia Civil (LNEC), Lisboa, Portugal  
xana.carvalho@lnec.pt



2 – Sociedade Portuguesa de Engenharia Sísmica (SPES), Lisboa, Portugal



### Introduction

Seismic source zones, and its characterization, have major impact in Probabilistic Seismic Hazard Analyses (PSHA).

In 2006, a model with eleven seismogenic zones was considered to re-evaluate the seismic hazard for Mainland Portugal, supporting decisions for the seismic zonation map presented in the Portuguese Annex of Eurocode 8. Between 2008 and 2009, in the aim of projects ERSTA and SHARE, there were alternative area source models developed, together with the estimate of activity rates parameters and magnitude distribution.

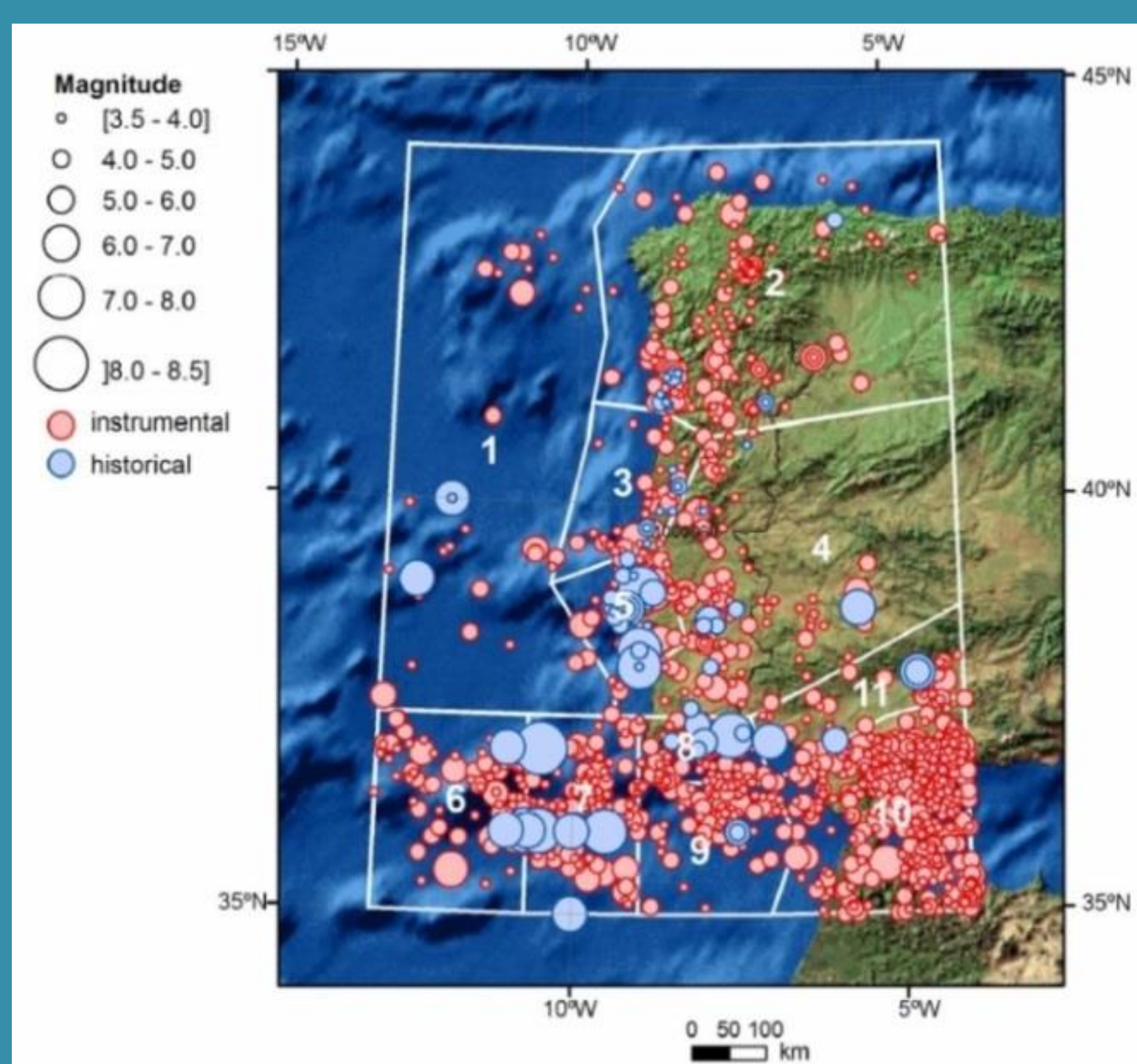
These different proposals (together with ground motion prediction equations assumptions) result in quite different seismic hazard levels, leading to a need, among decision makers, to understand the origin of such differences.

The national earthquake engineering society (SPES) promoted, among scientific community, a study to evaluate the origin of such differences.

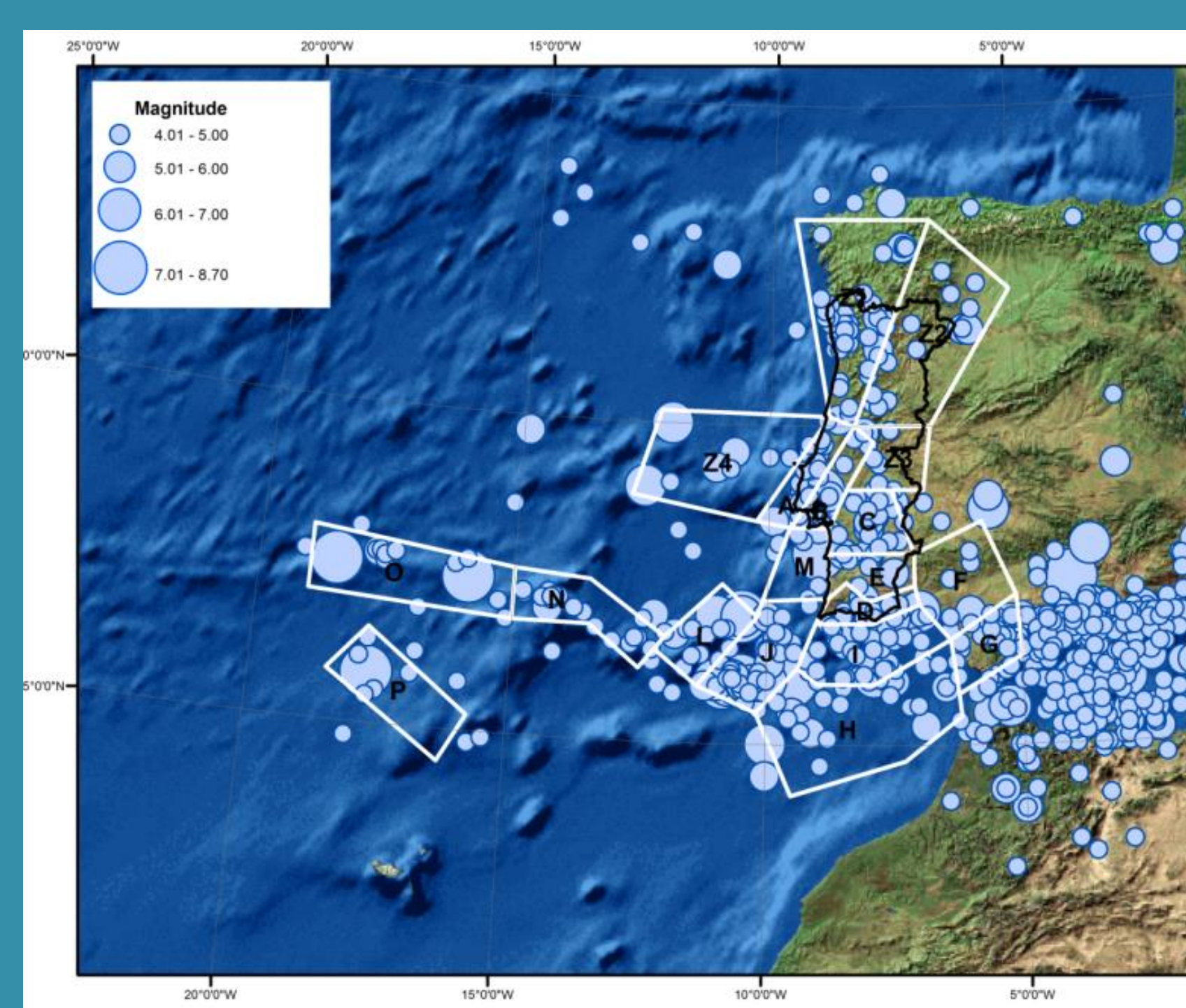
In this work the earthquake activity rates, b-values and magnitude distribution for the mentioned source zones proposals are analysed, with particular emphasis on its implications for the recurrence period of large seismic events. Hazard maps are also assessed, for different ground motion prediction equations, and a comparison analysis was carried out.

### Models

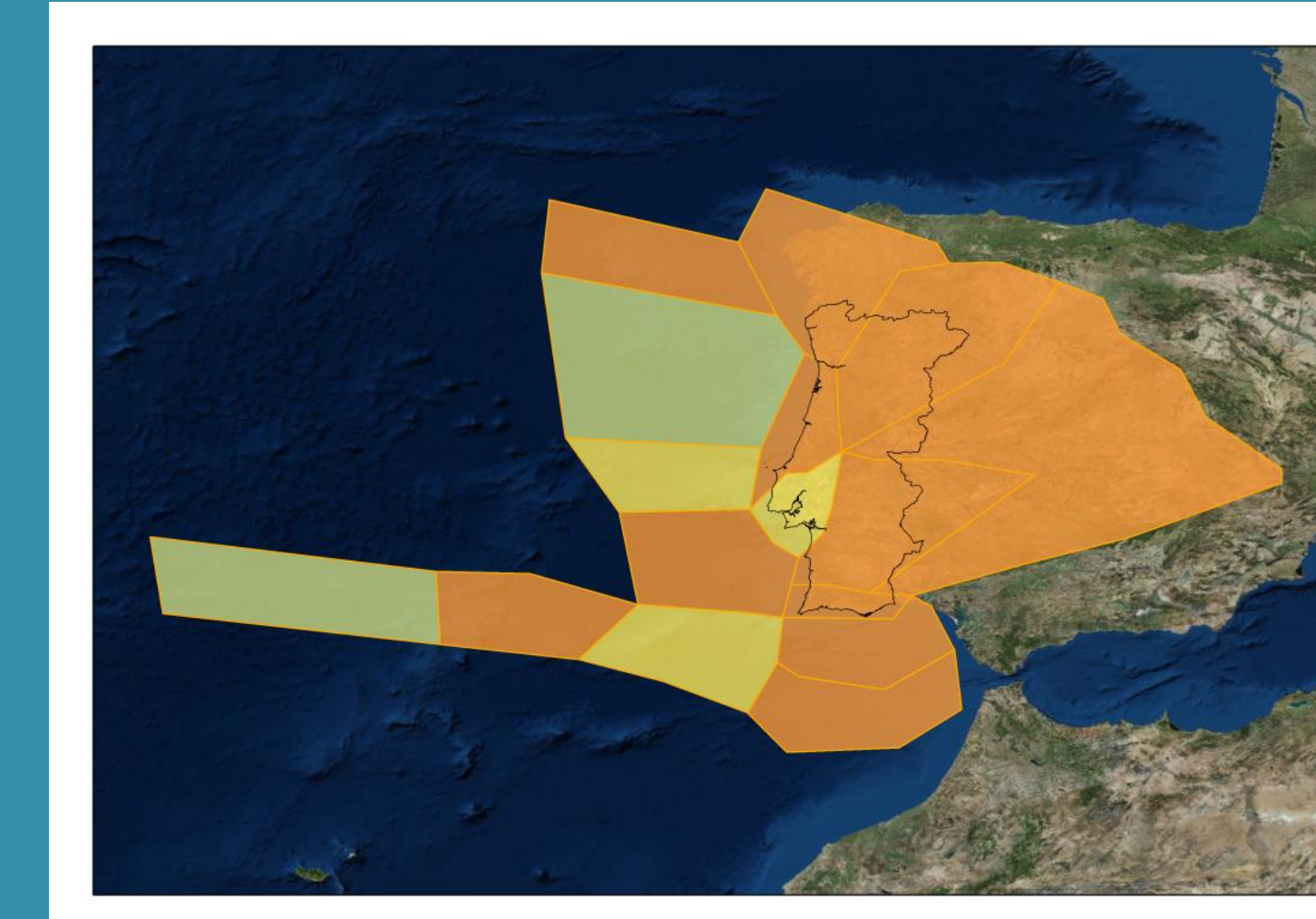
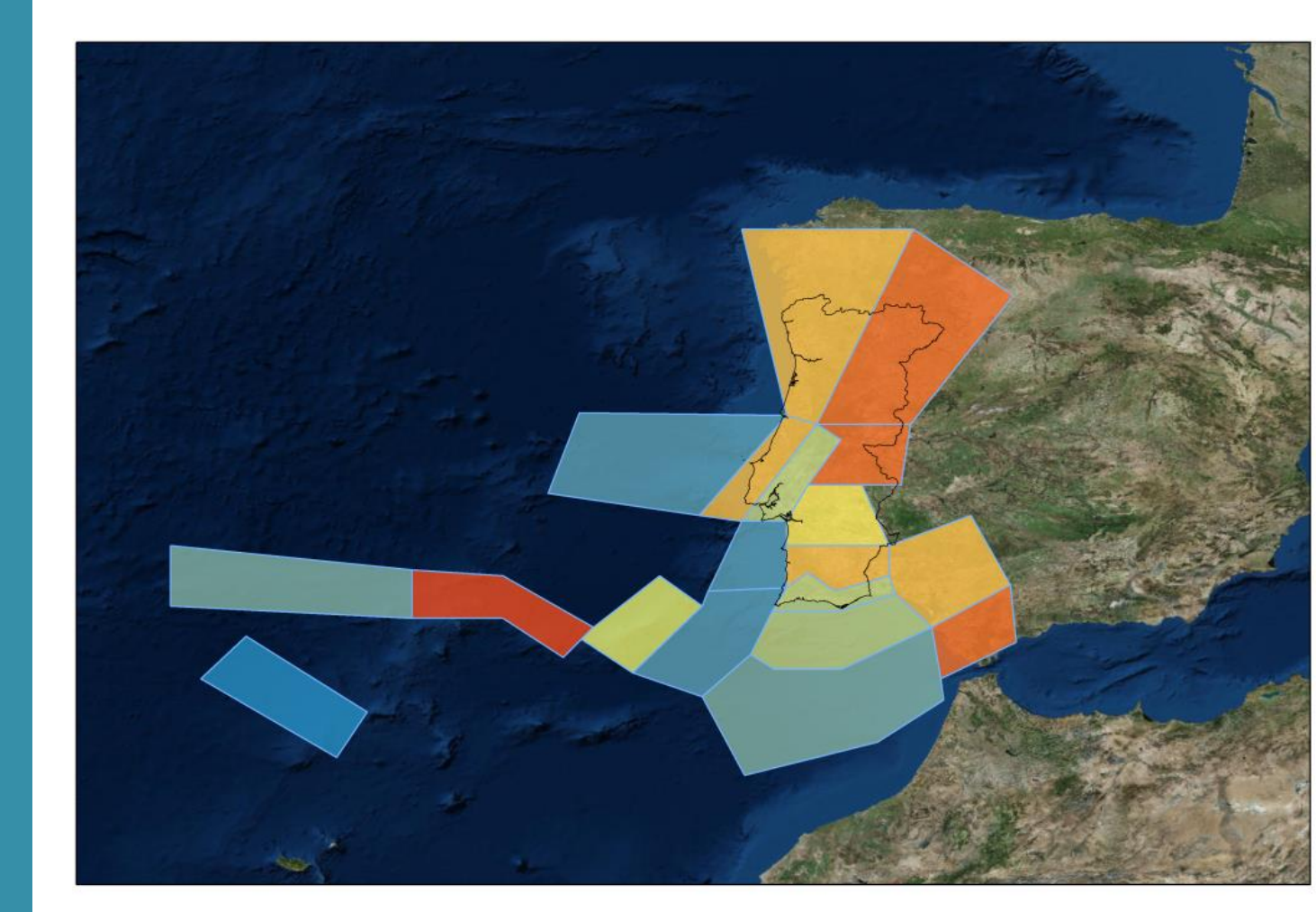
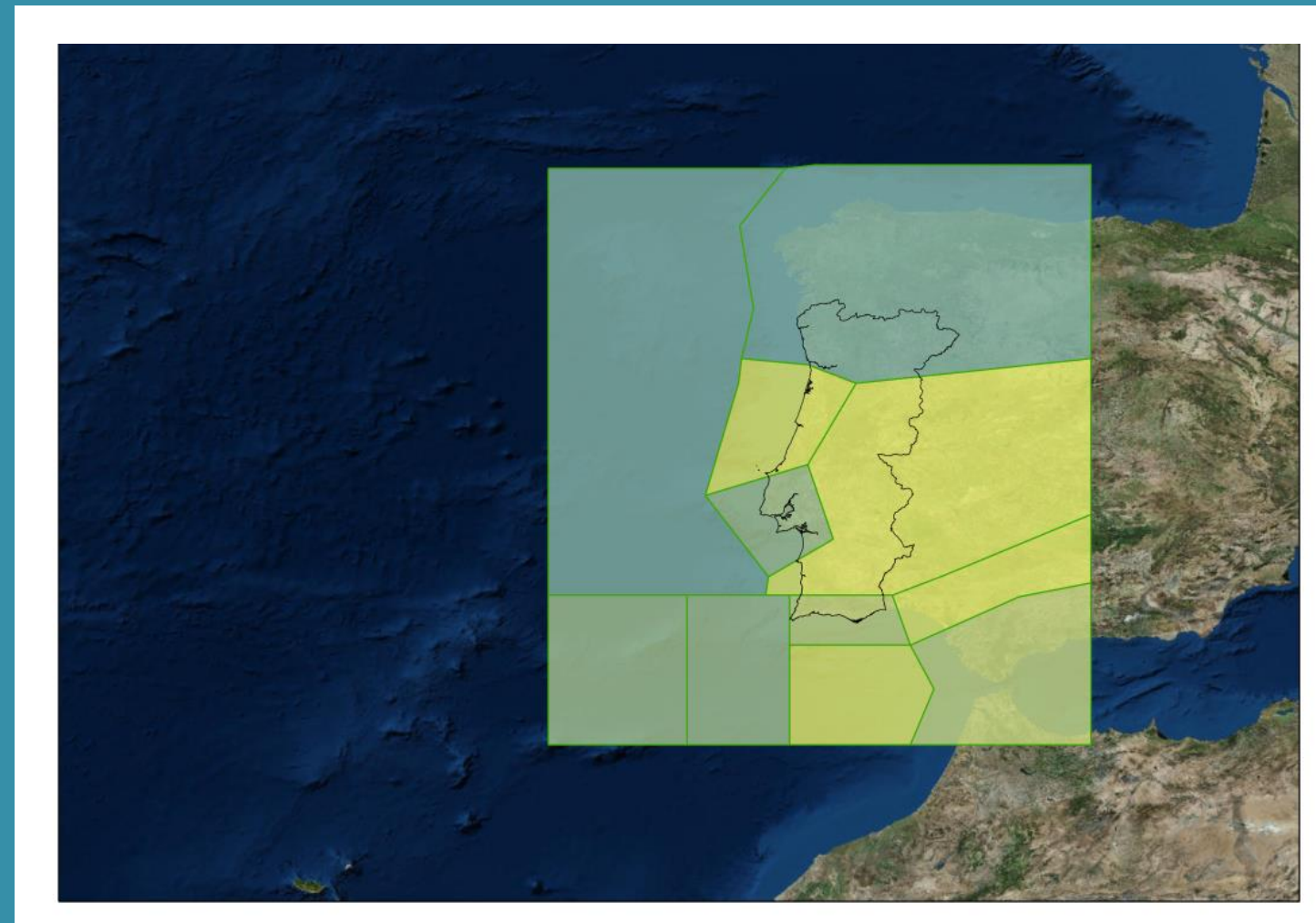
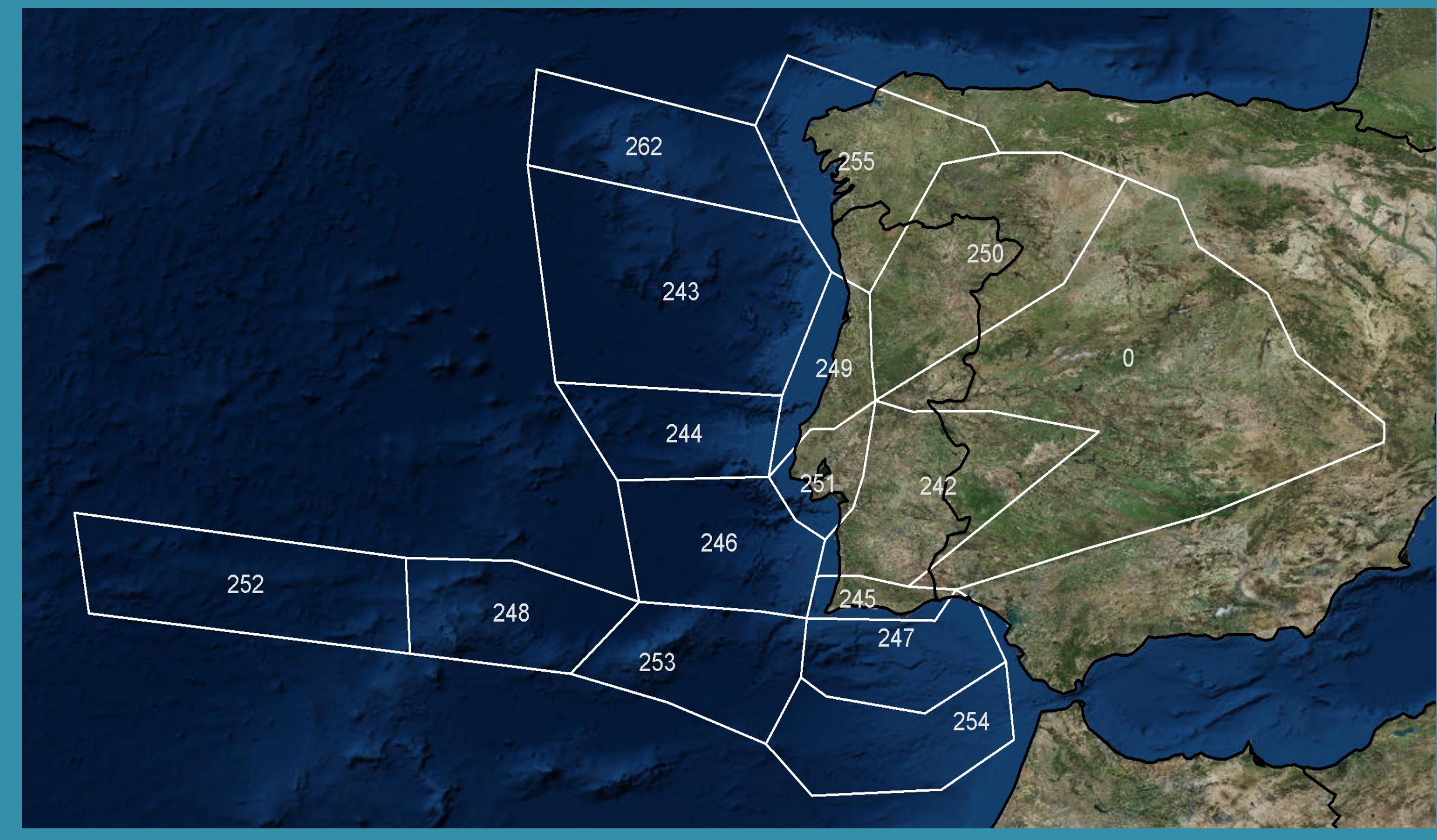
#### EC8 (2006)



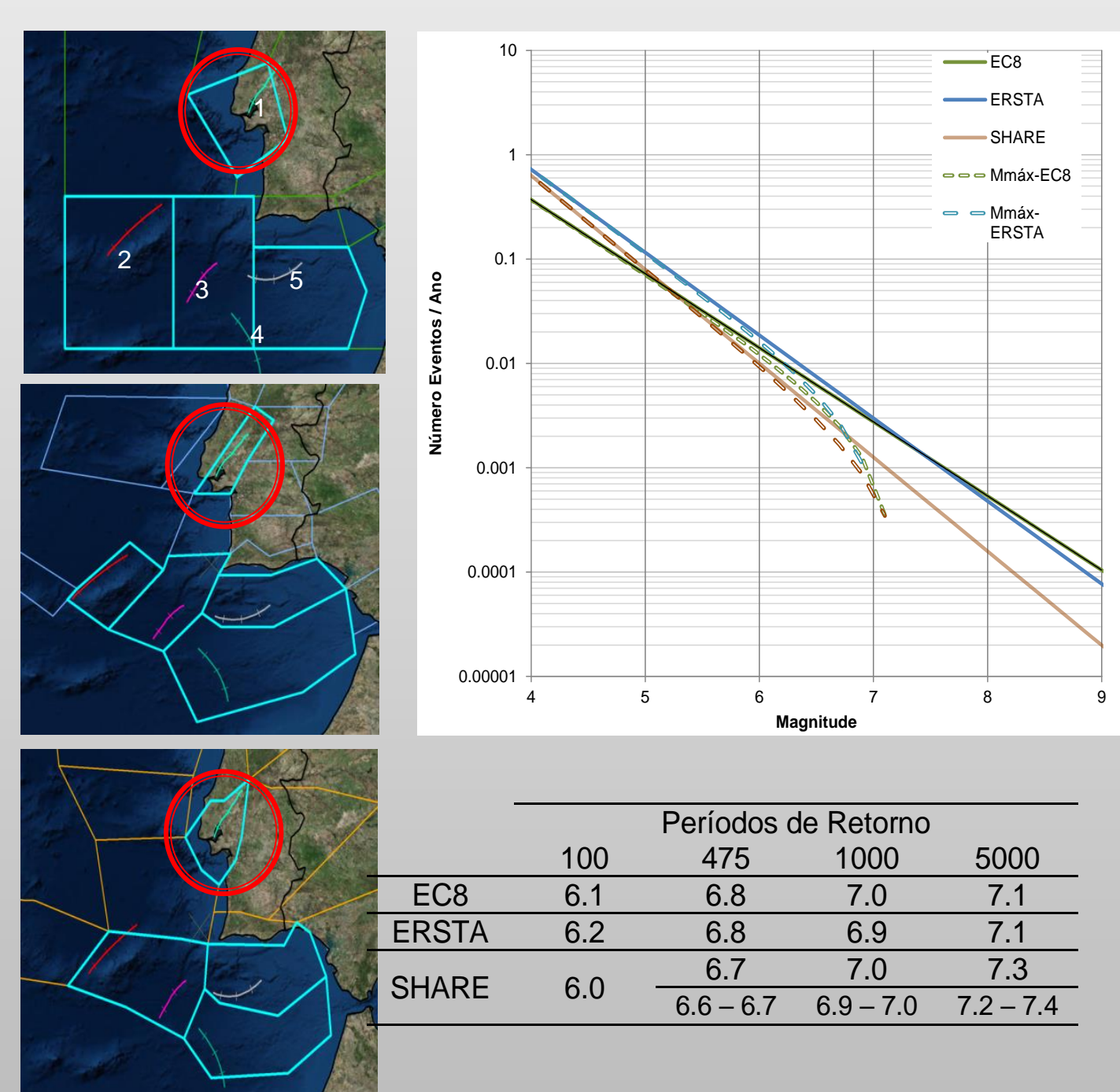
#### ERSTA (2008-2011)



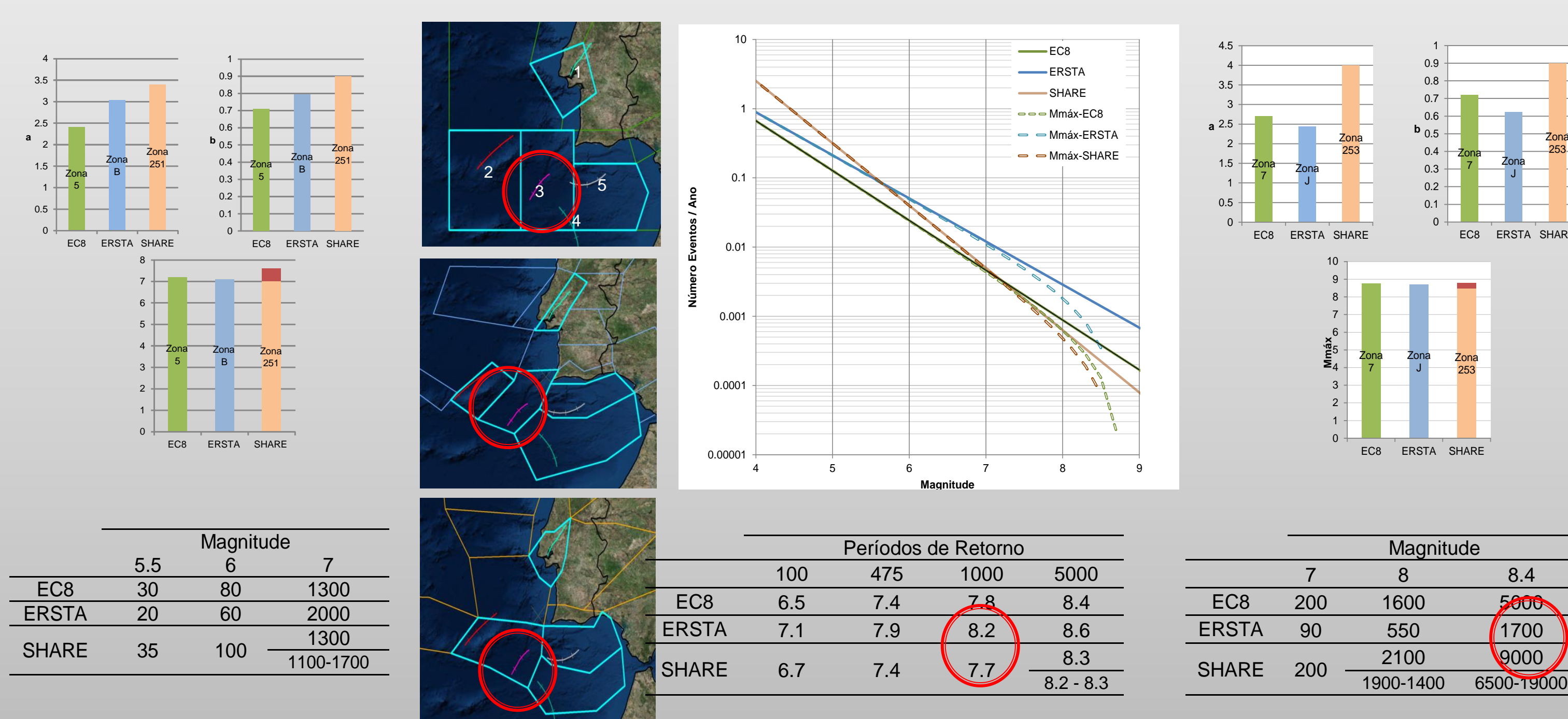
#### SHARE (2009-2013)



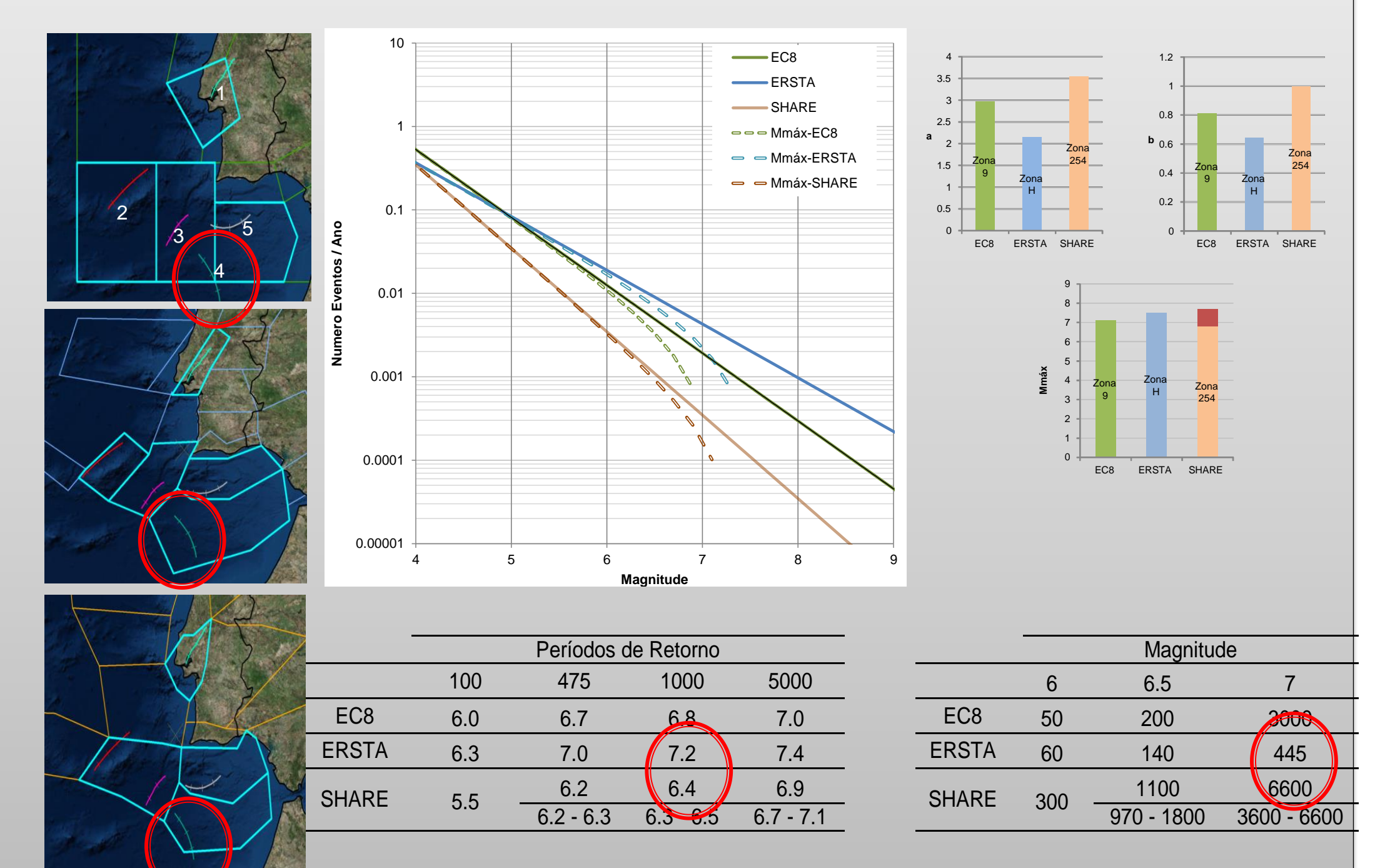
#### Lower Tagus Valley



#### Horseshoe Fault

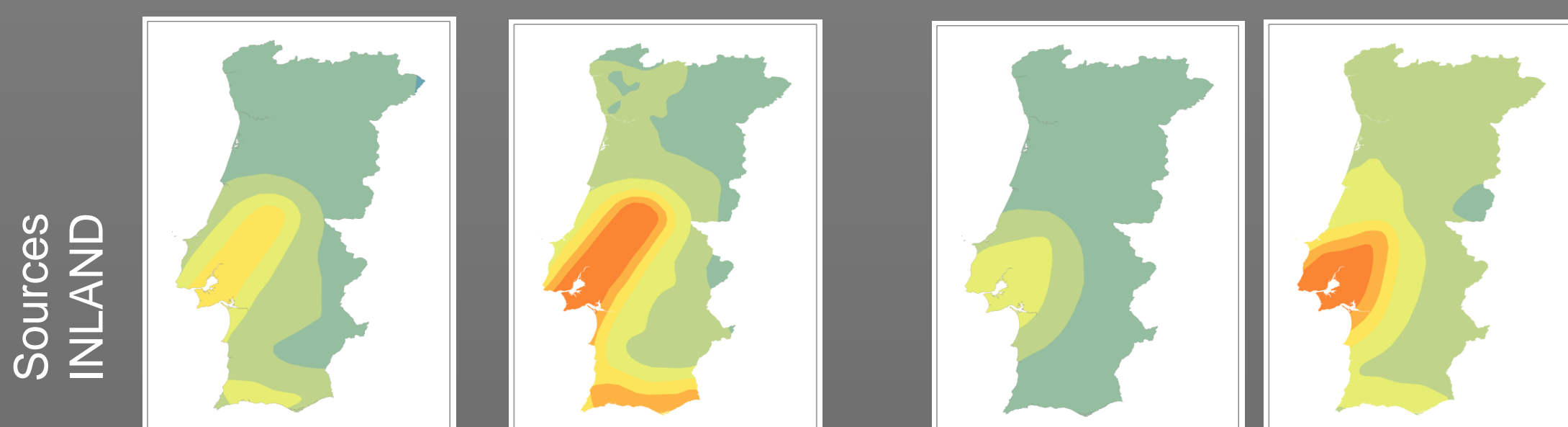


#### Gulf of Cadiz



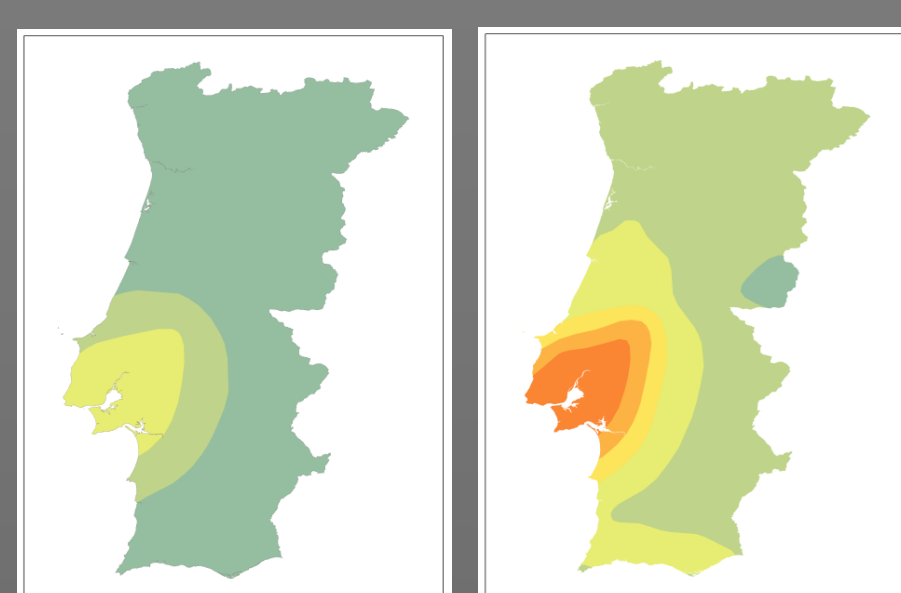
#### ERSTA

475 YEARS 2475 YEARS



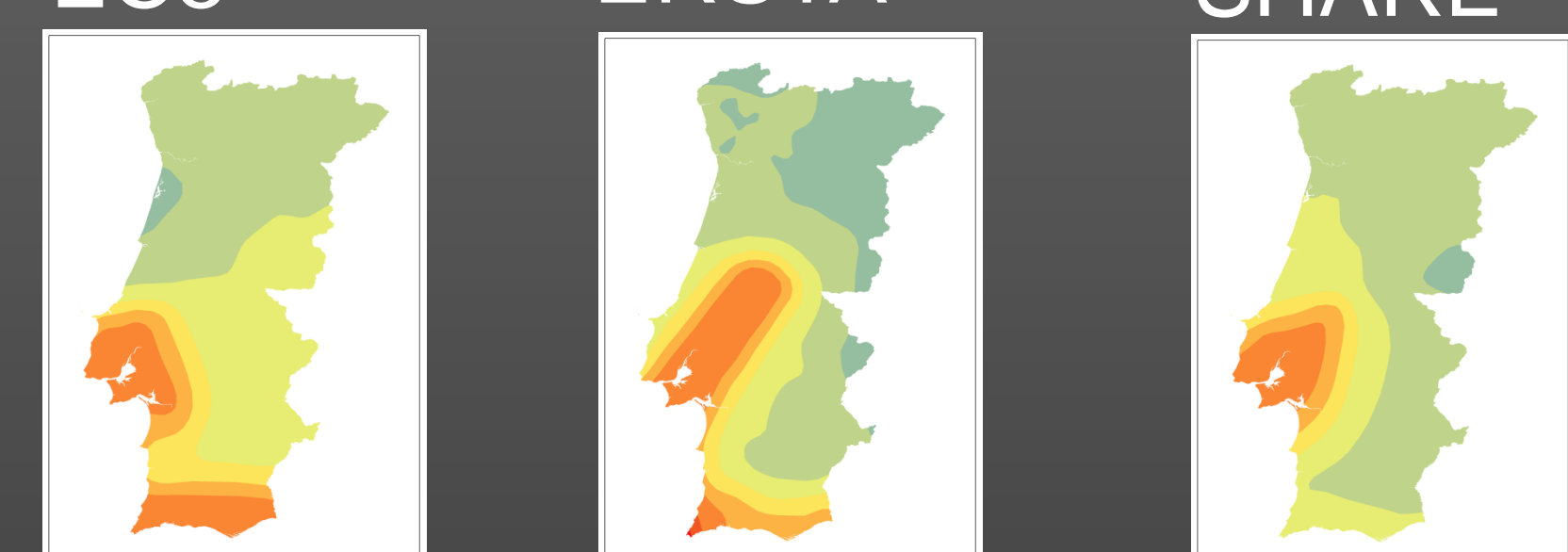
#### SHARE

475 YEARS 2475 YEARS



#### EC8

Total hazard  
2475 YEARS



### Conclusions

- Gutenberg–Richter law lead to important differences among the three source models analysed, considering the recurrence period of large seismic events.
- ERSTA took advantage of a revised instrumental catalogue.
- Higher *b* values considered by SHARE in offshore area-source zones lead to an underestimation of the recurrence periods for larger magnitude, and they are not representative of long-term seismicity for Portugal mainland.
- The impact of uncertainties on source models and recurrences models (that rely on different datasets and assumptions) on hazard results cannot be ignored.
- The zonation map presented in the portuguese national annex of EC8 should be revised, as well.