UPDATING DEFAULT DEPTHS IN THE ISC BULLETIN

Maiclaire Bolton, Dmitry Storchak and James Harris

International Seismological Centre, Thatcham, UK.
maiclaire@isc.ac.uk

ISC Depth Determination

- The ISC location program deals with depth determination in the following manner:
  - Free depth, if possible
  - Depth phase depth, if possible
  - Fixed depth
    - Fixed on reported depth
    - Fixed on default depth
- After this step, the ISC seismologists edit the bulletin and can review and change the depth if appropriate.

How Defaults Are Used

- Currently we use 3 default depths:
  - 0 – for explosions
  - 10 – for mid-ocean ridges
  - 33 – for nearly everything else
- In addition, seismologists assign multiples of 100, based on residuals of secondary phases.
- Some of these defaults no longer seem to be appropriate.

Updating the Default Depths

- We would like to review our policy because we feel better default depths would lead to:
  - Better association of secondary phases.
  - Marginally better locations.
  - Seismicity map will become more realistic.

Our Plan

To update the default depths within the ISC bulletin.

- Used Flynn-Engdahl geographic regions.
- Two methods of choosing new default depth:
  1. **Preferred Method:**

     Based on on well constrained events in the ISC bulletin. Each region must contain at least 50 well constrained events.
  2. **Alternate Method:**

     Based on Crust 2.0 (Laske, Masters, and Reif). Use the half depth of the crust (averaged for geographic region).

** This project is in a preliminary stage **

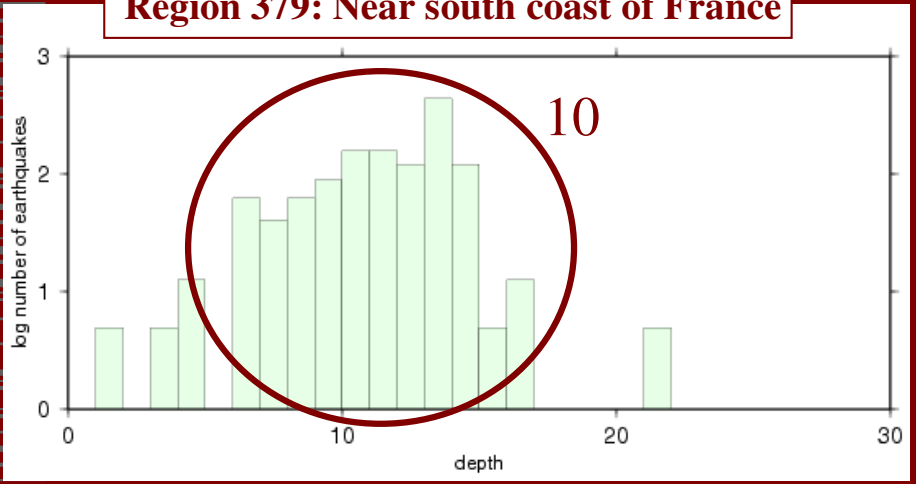
Criteria for Selection of Well Constrained Events

At least 50 events in each geographic region with parameters qualifying to:

1. Free depth:
   - At least 1 station within 30km
   - Azimuthal gap not greater than 90^{o}
2. Depth phase depth:
   - At least 25 depth phases used in depth calculation (implies that depth phases are reported by several agencies)

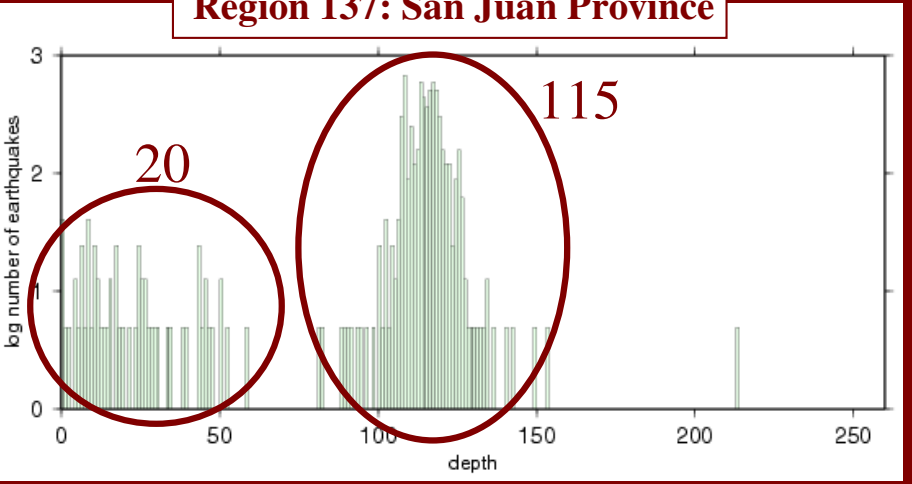
Examples of Depth Distribution

Region 379: Near south coast of France



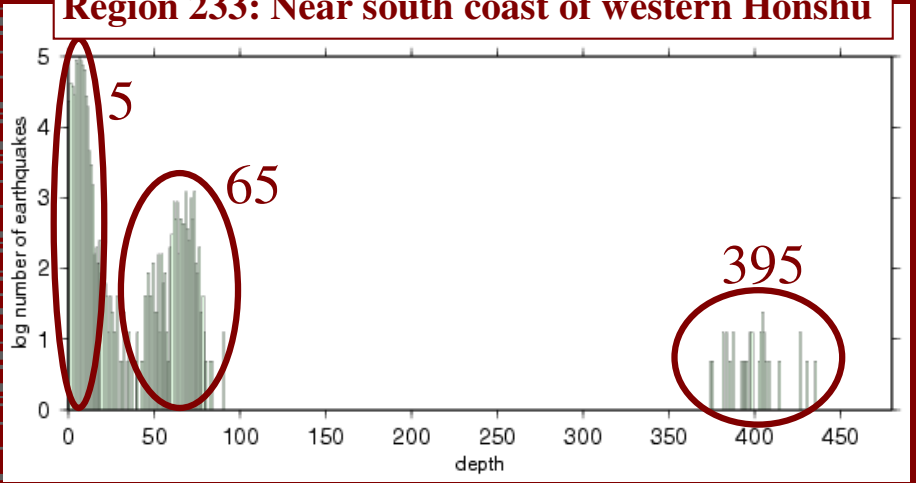
One default depth

Region 137: San Juan Province



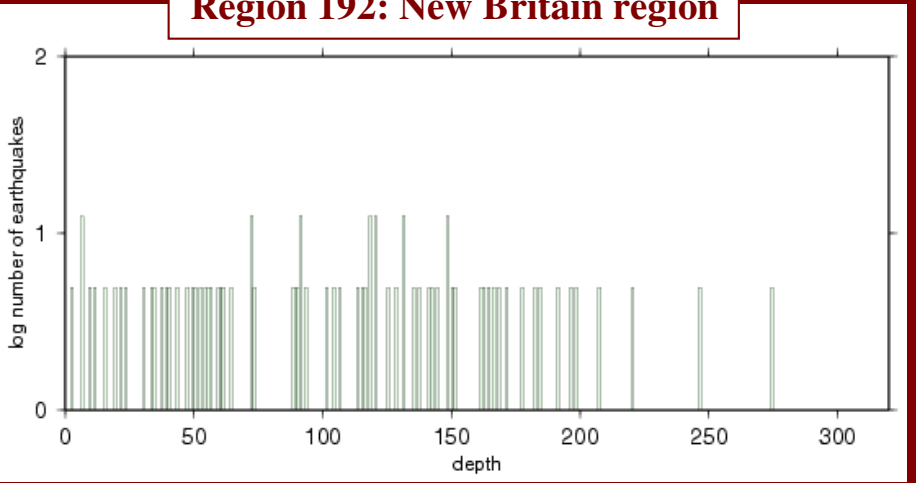
Two default depths

Region 233: Near south coast of western Honshu



Three default depths

Region 192: New Britain region

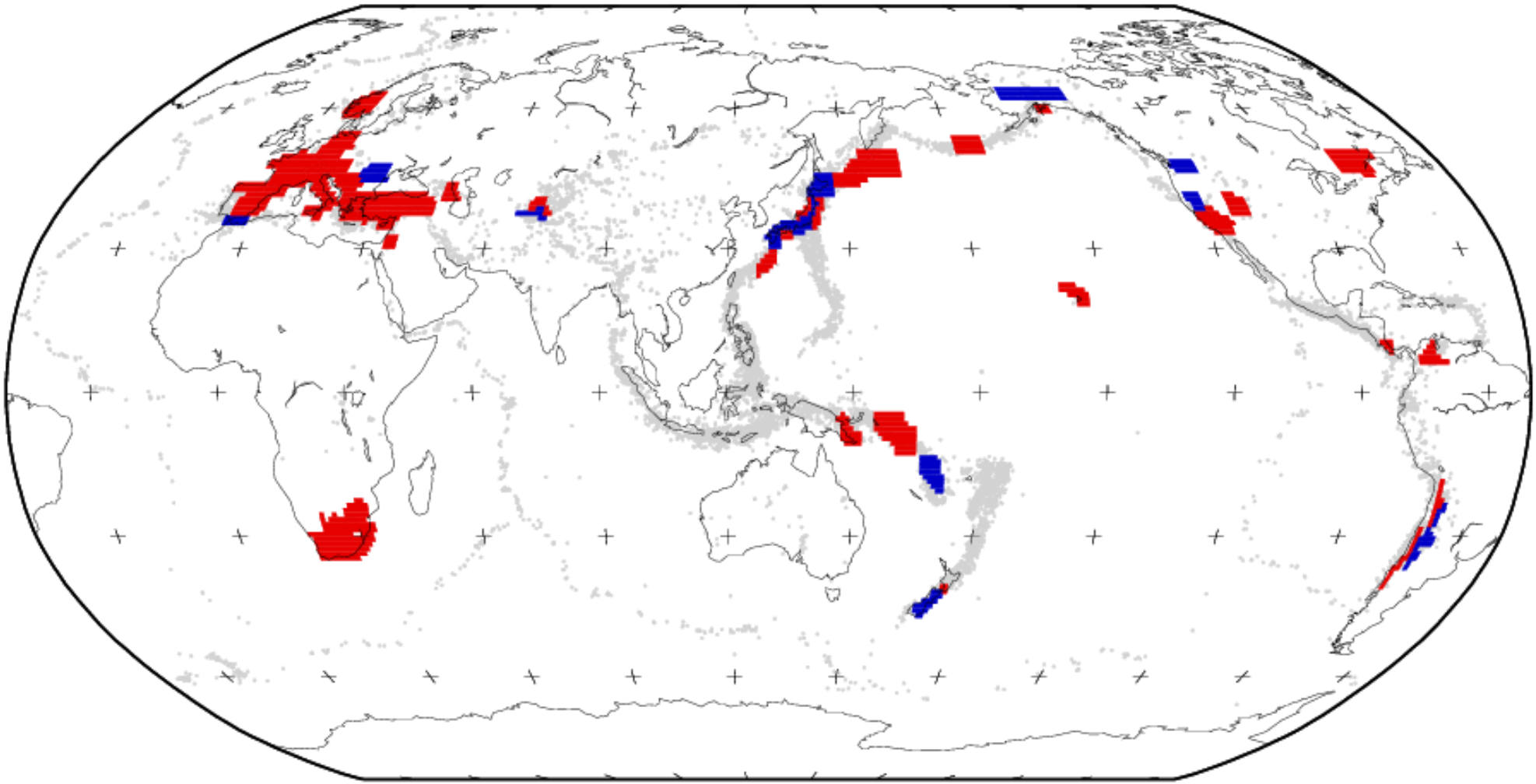


No clear pattern

Determination of Default Depths

- For each geographic region:
  - Reviewed the distribution of depth.
    - Determined if a default could be obtained.
    - If more than one default, separated the data.
  - Statistically computed the average depth.
    - Removed outliers beyond 2 standard deviations, recomputed the average, and rounded to the nearest 5km.

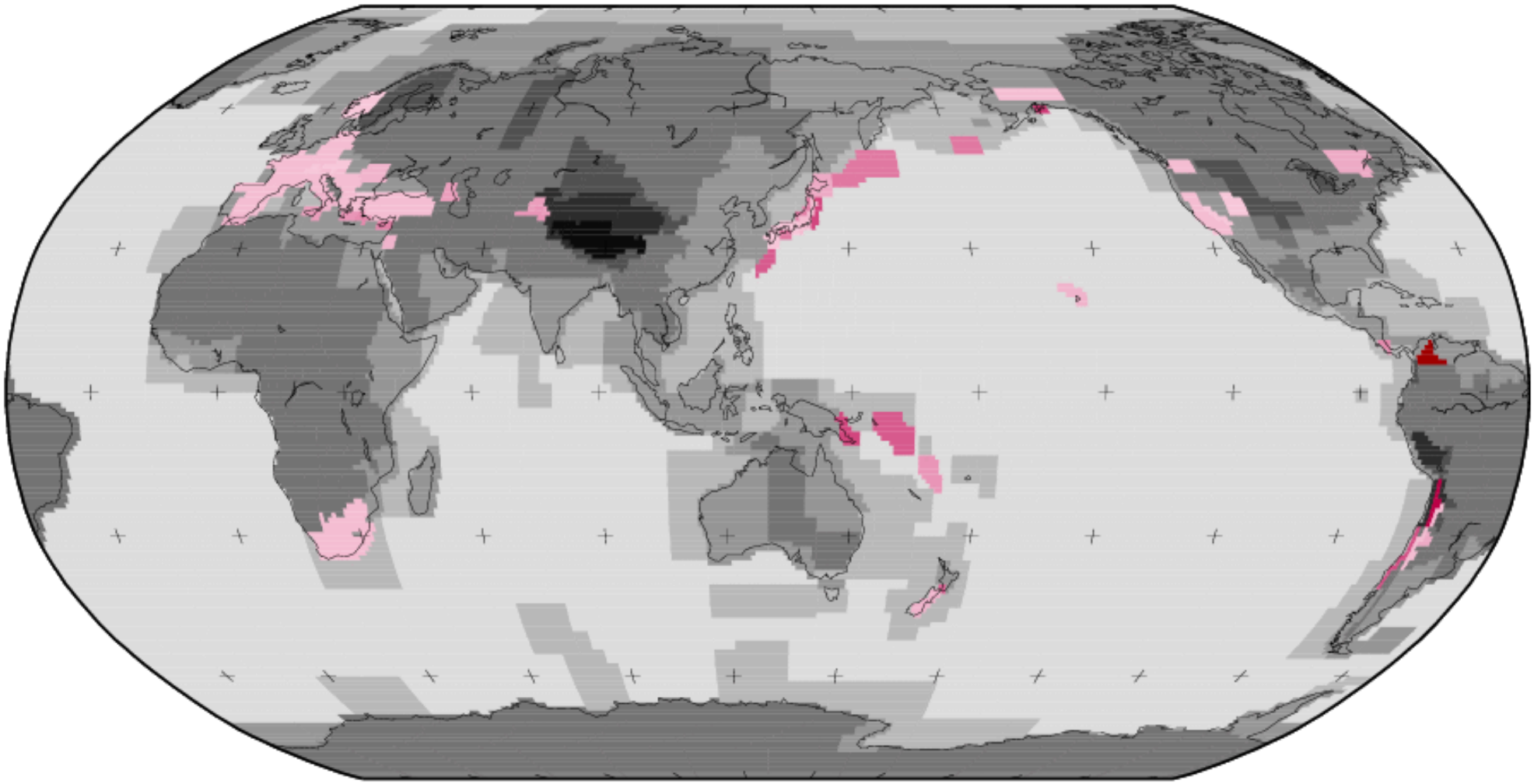
Proposed Default Depths from Selected ISC Locations



One Default Depth

More Than One Default Depth

Proposed Default Depths



Depth Based On (km)

Crust 2.0 5 35

Selected ISC Location 5 165

Future Directions

- Improve resolution:
  - At this preliminary stage we have used Flynn-Engdahl geographic regions.
  - We hope to improve this to a grid.
- Looking for feedback:
  - We intend to verify defaults with local agencies.