

THE ROLE OF BIBLIOMETRICS IN EVALUATING SCIENTIFIC RESEARCH

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Background

- Use of bibliometrics is increasing rapidly

- Bibliometrics are perceived to be
 - ▣ Quantitative
 - ▣ Objective
 - ▣ Scientific
 - ▣ Accessible

- So, they're useful for evaluation, right?

Research Evaluation

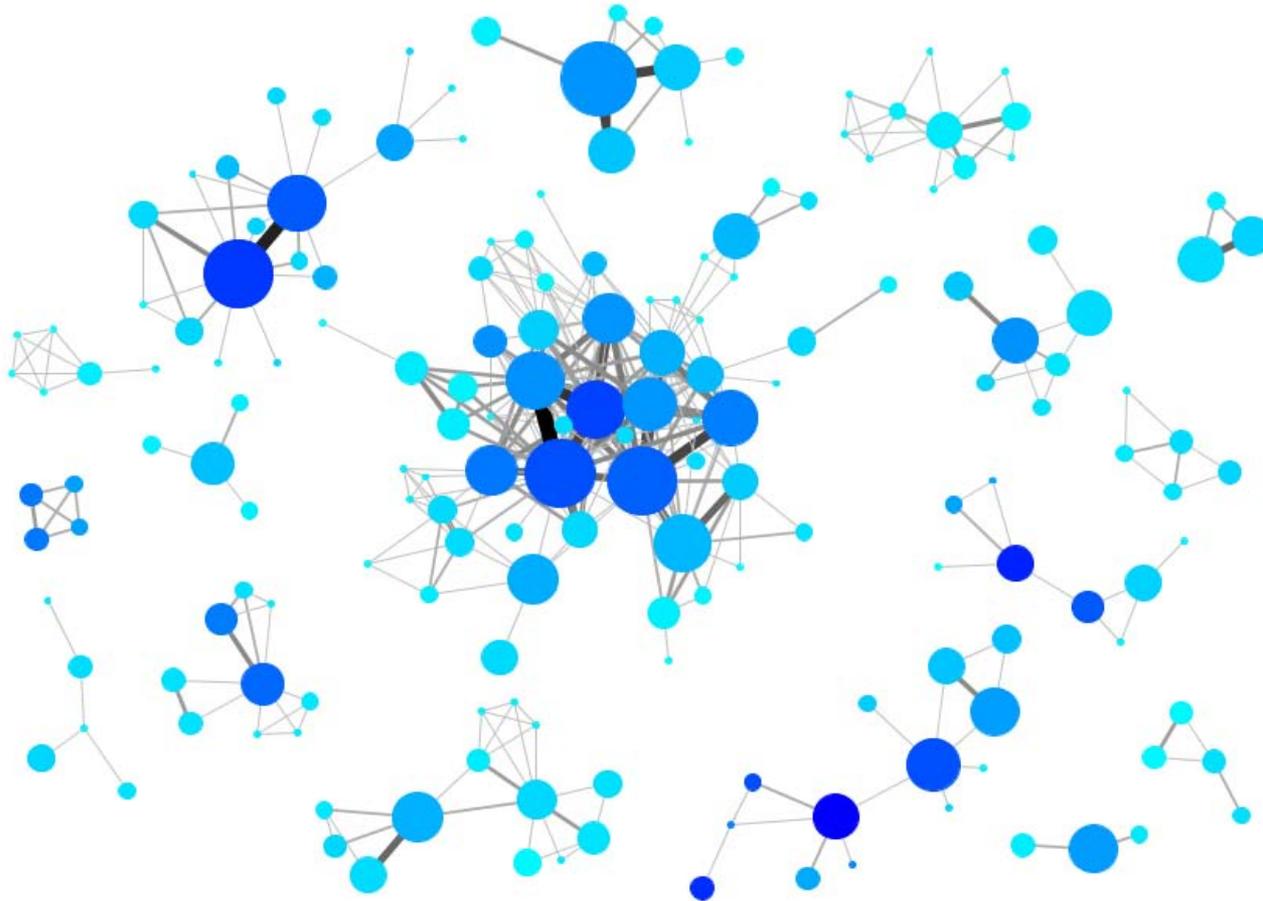
- Evaluation is about asking the right questions
- Evaluation questions need to
 - ▣ Provide useful information about a program
 - ▣ Be answerable by accessible data
- So: what questions can bibliometrics answer?

Answerable Questions

- Who did the research?
- What research was done?
 - ▣ What was the impact of that research?
- When was the research done?
- Where was the research done?

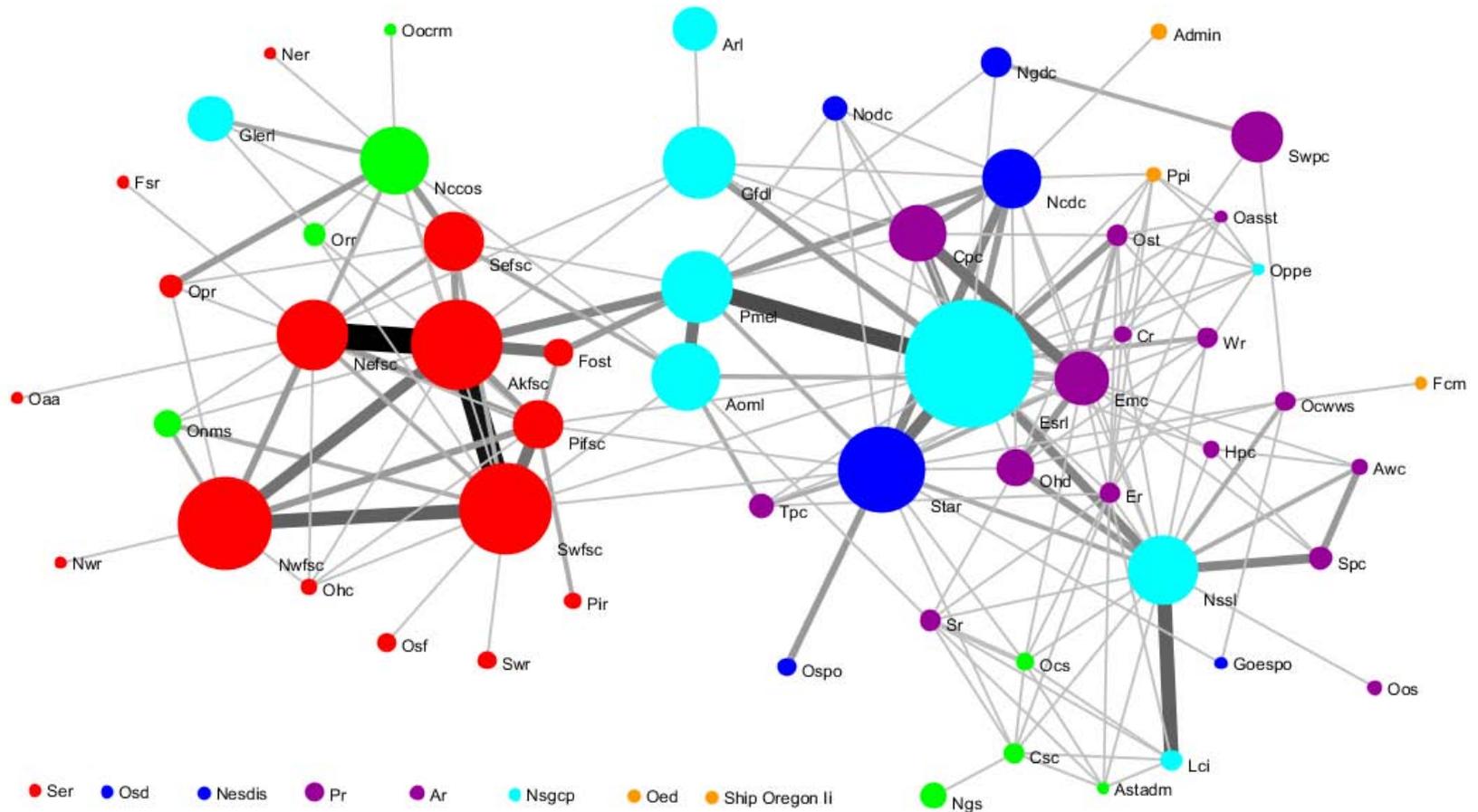
Who did the research?

Who: Individual Collaboration



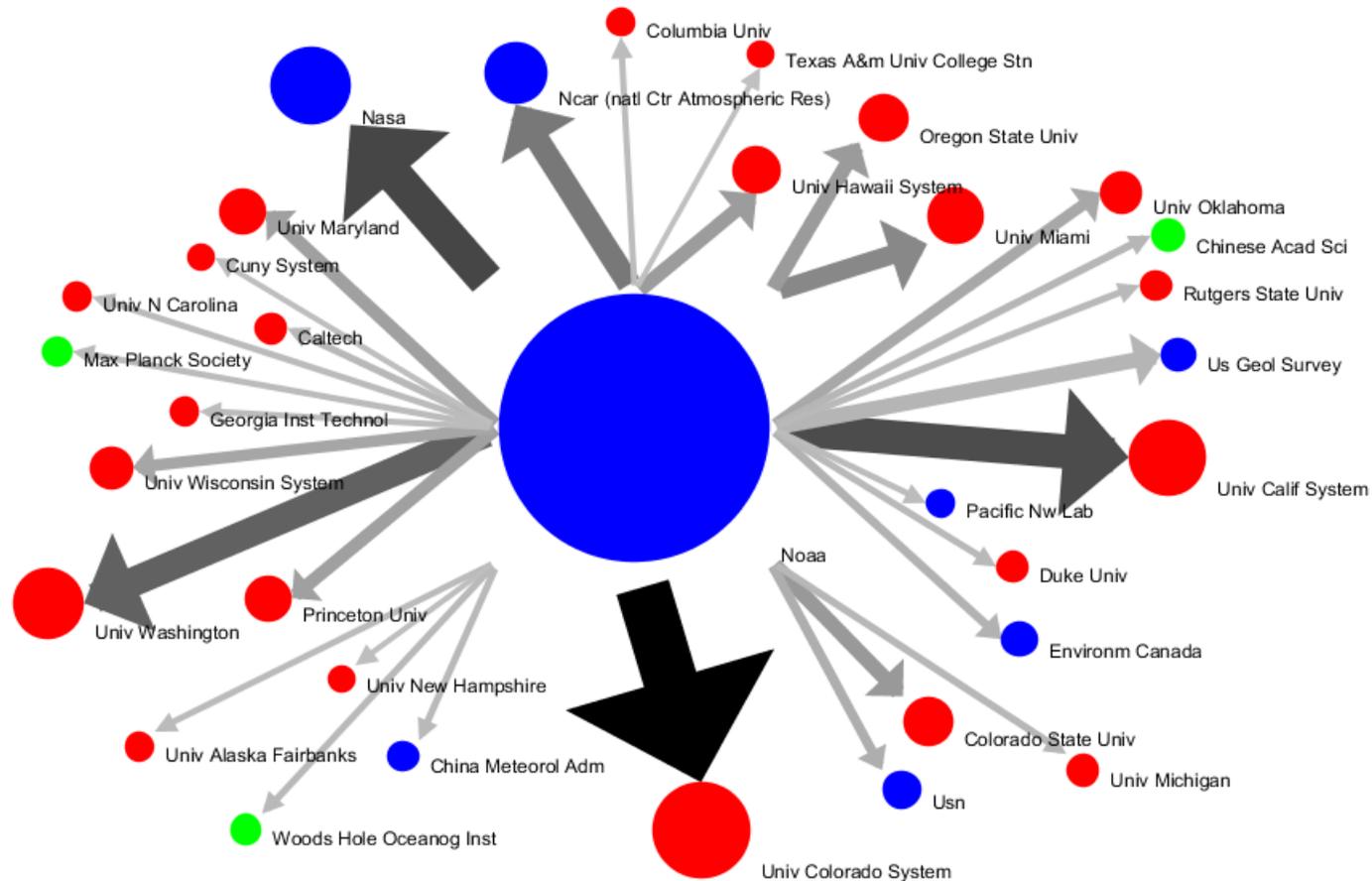
Co-author network generated from journal articles sponsored by NOAA OER

Who: Organizational Collaboration



Research division collaboration network based on NOAA FY12 publications

Who: Institutional Collaboration

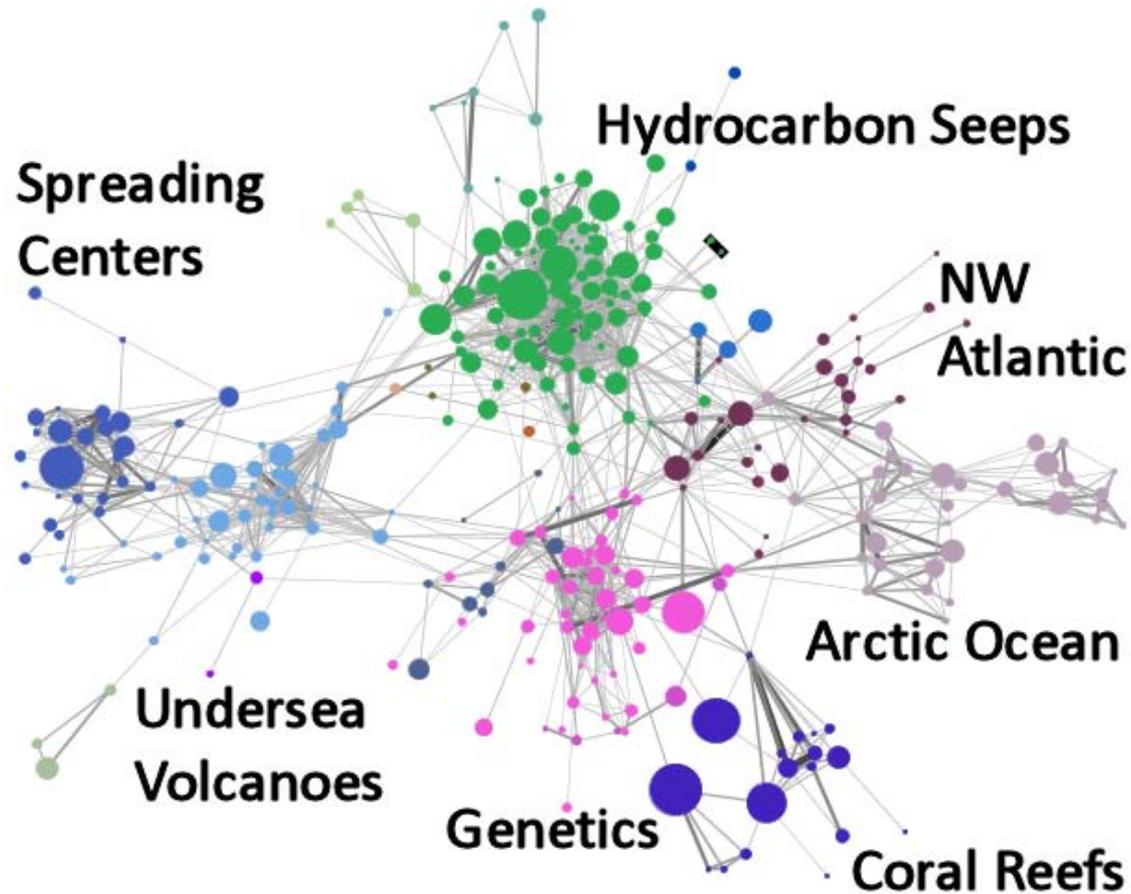


Collaborations between NOAA and other institutions based on CY2011 publications

What research was done?

And what was the impact of that research?

What: Paper Citation Maps



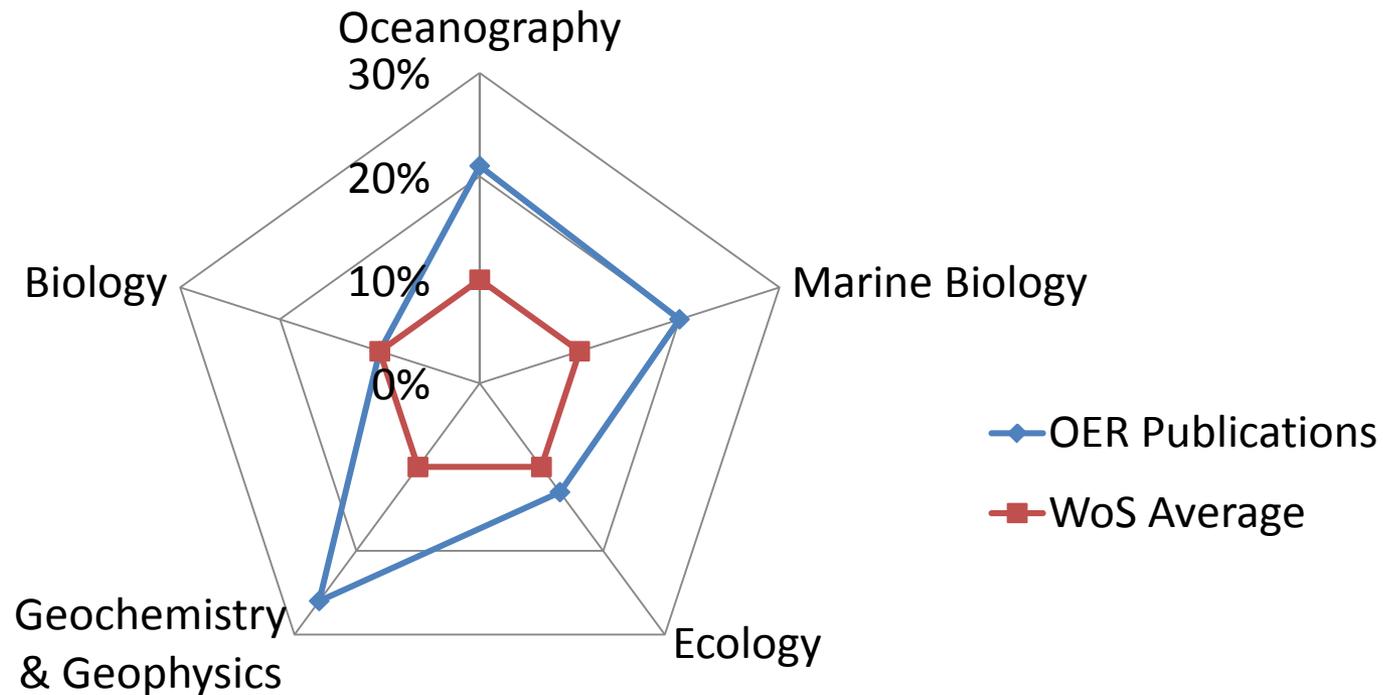
Article citation network of OER-sponsored journal articles

What: Research Impact

Bibliometric Indicator	Value
Number of Publications	452
Number of Times Cited	4,950
Average Number of Citations per Publication	10.95
H-Index	32

Standard bibliometric indicators for publications supported by OER

What: Research Impact

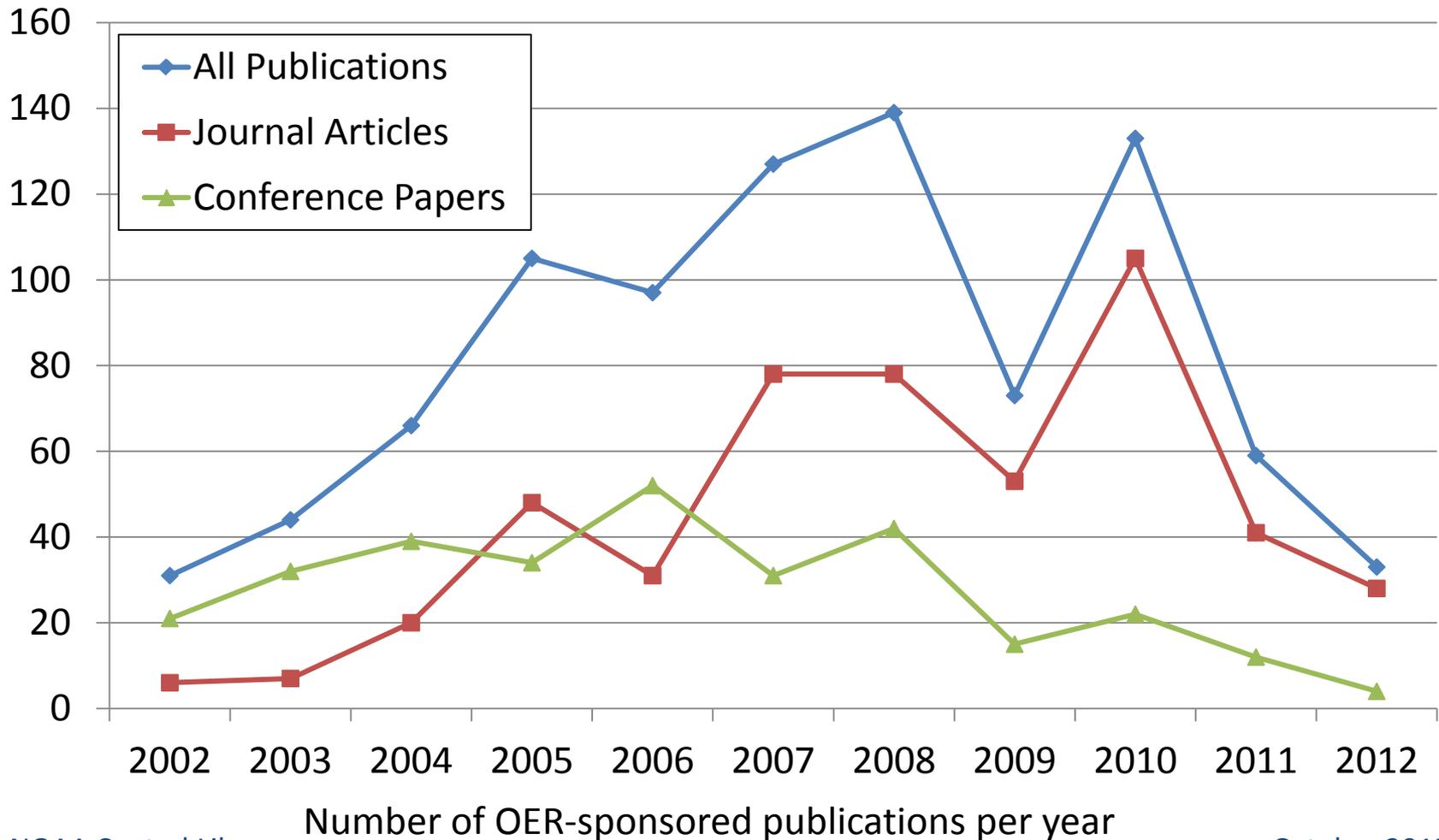


Percentage of publications in the top 10% for citation counts in five research areas

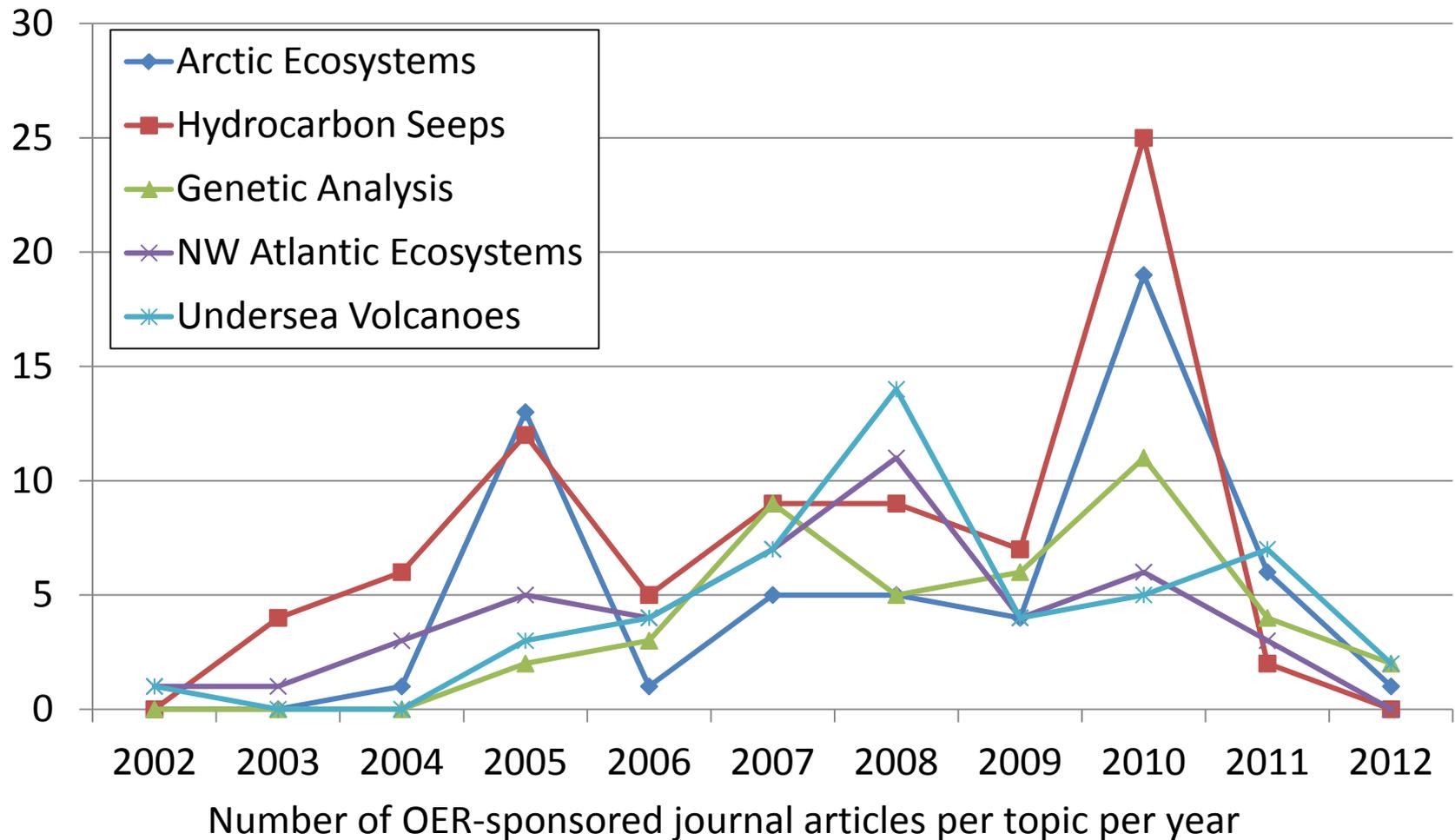


When was the research done?

When: Publication Trend

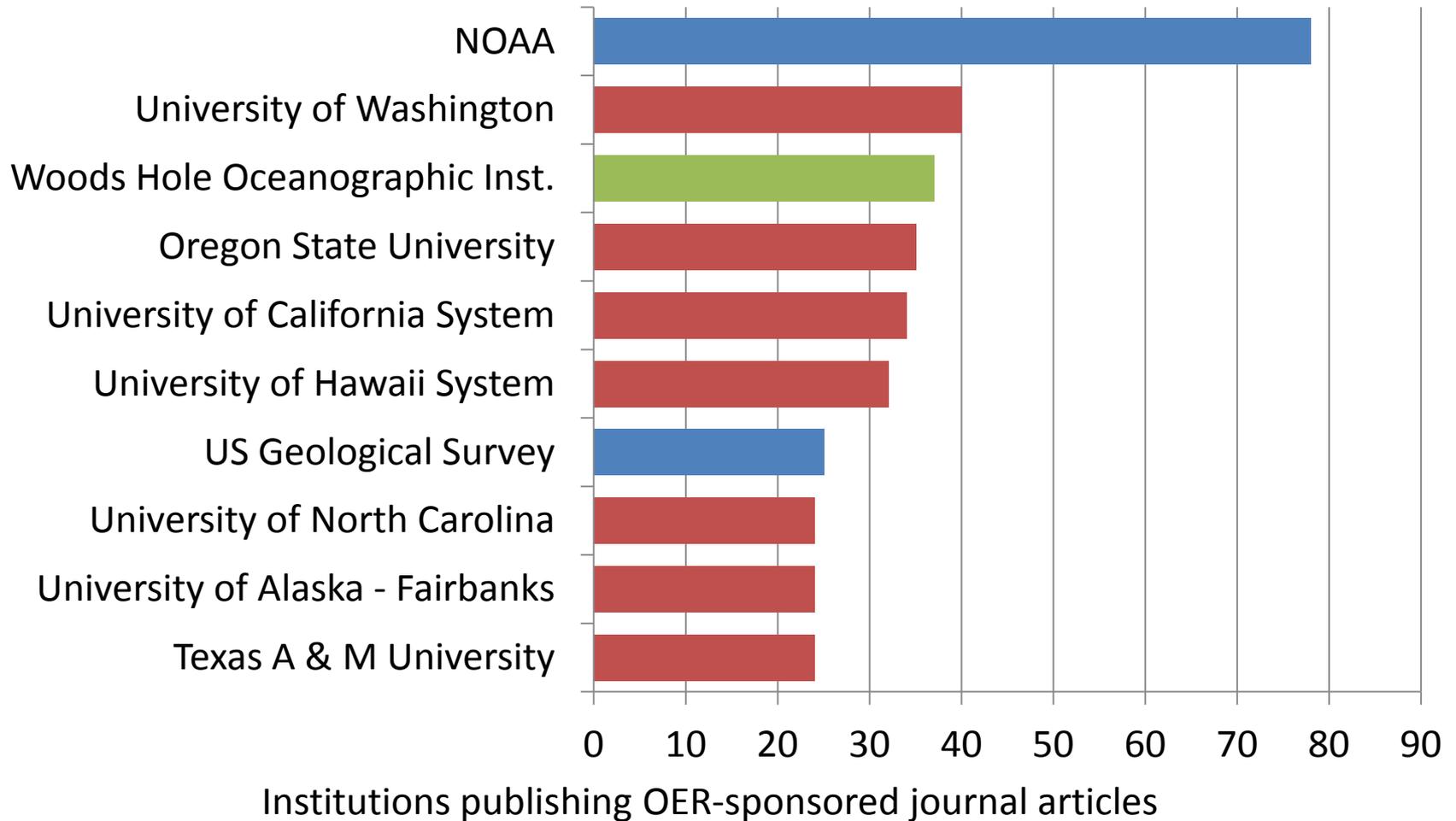


When: Publication Trend

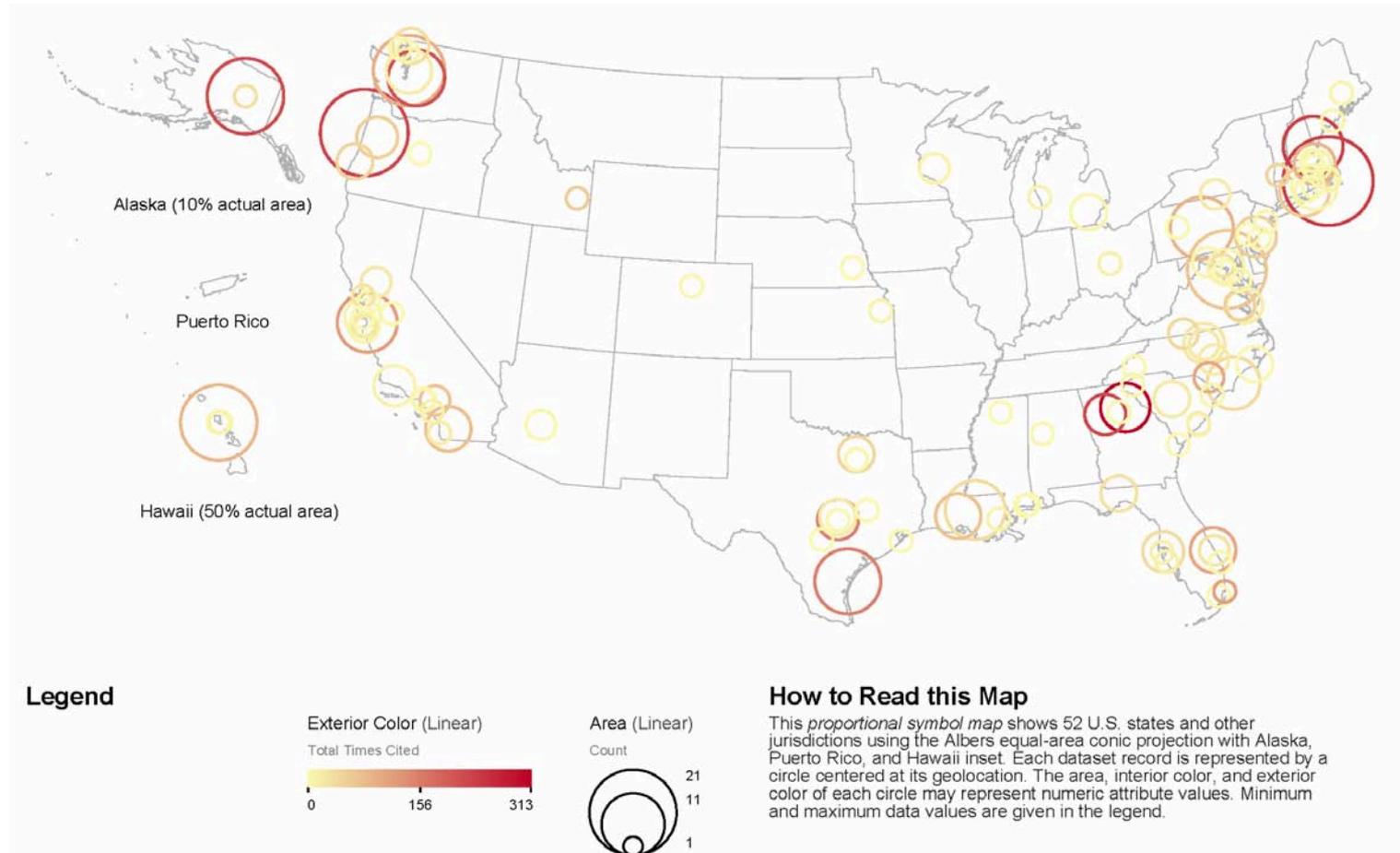


Where was the research done?

Where: Research Centers

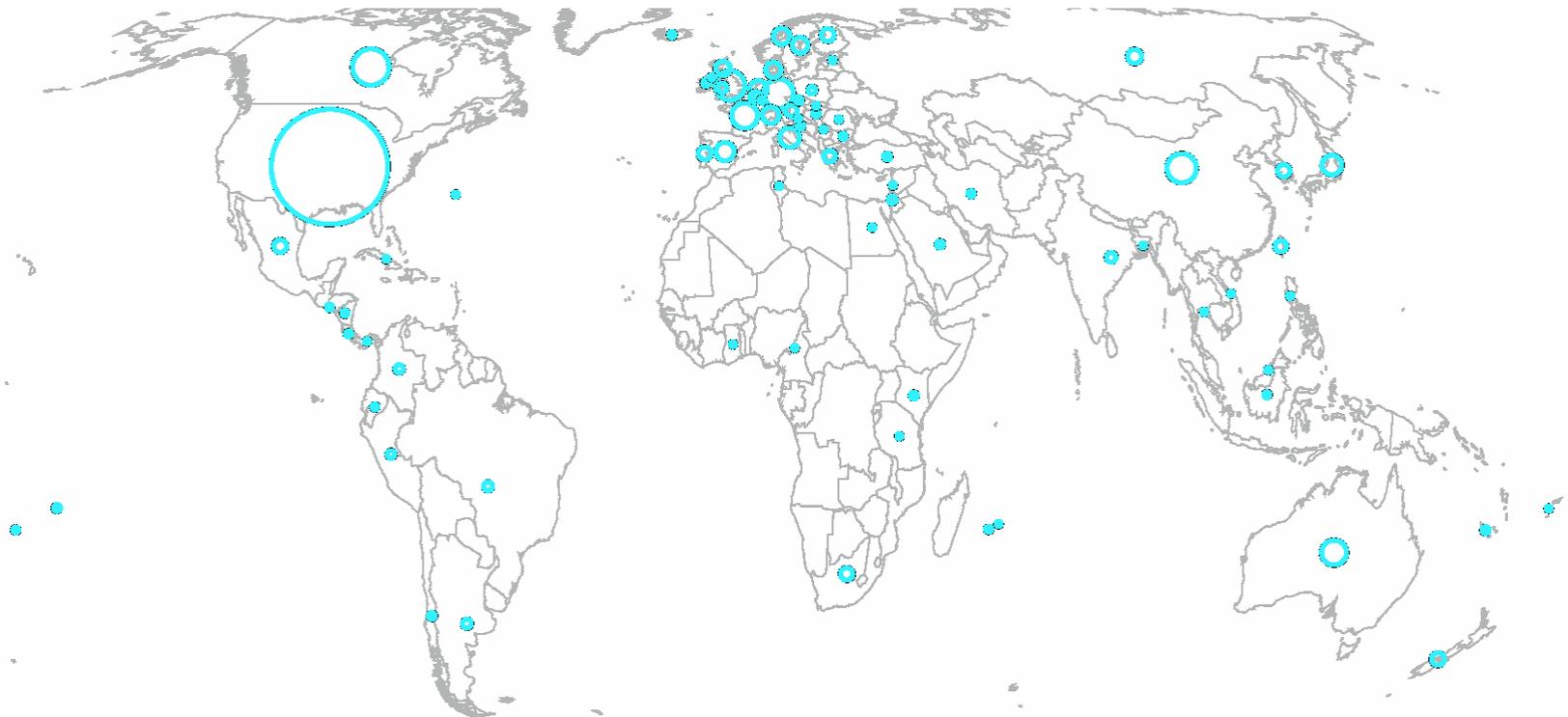


Where: National Mapping



Number of publications and times cited per zip code of OER-sponsored journal articles

Where: International Mapping



Number of publications per country based on NOAA journal articles from FY12

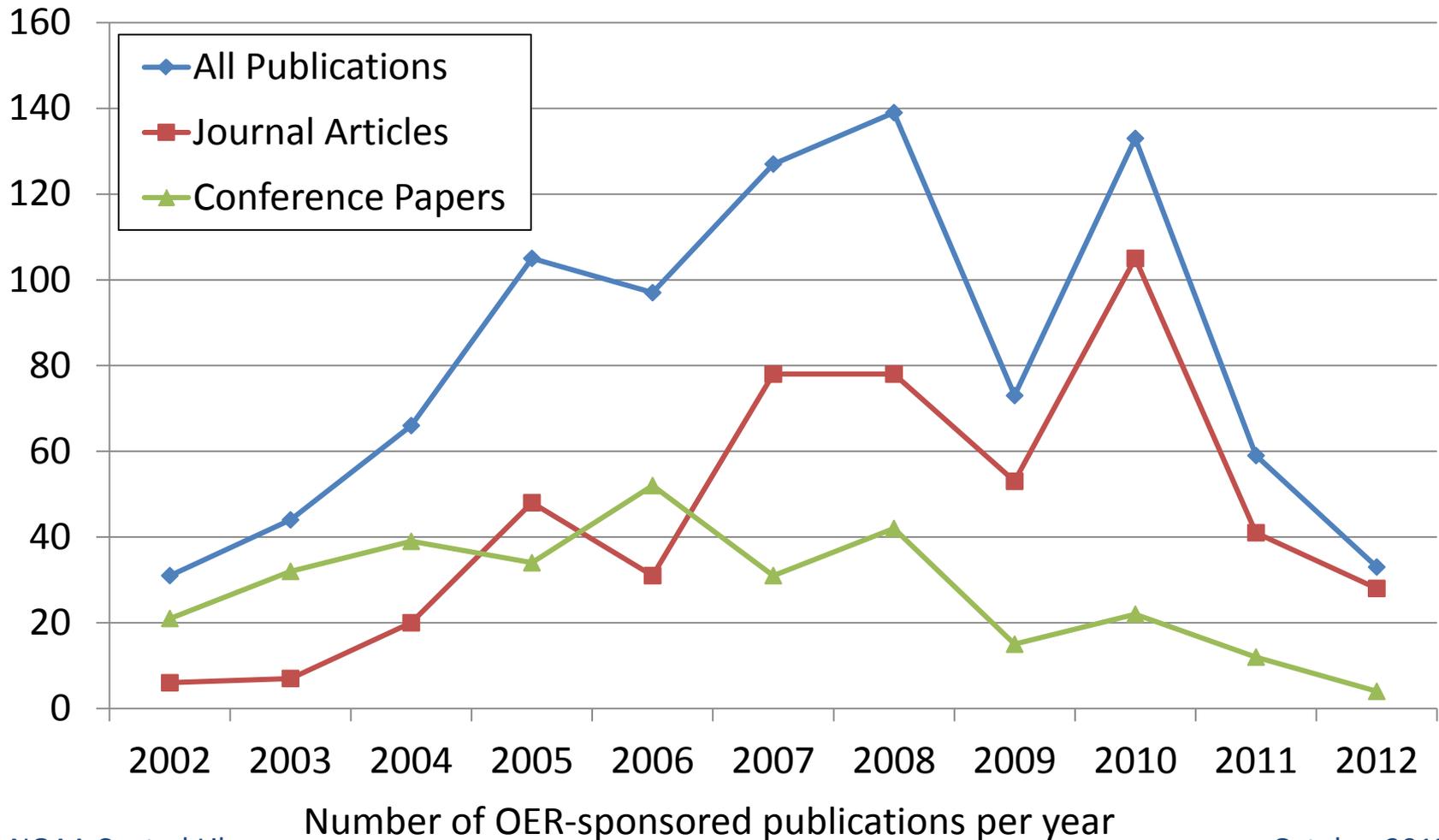
Limitations of bibliometrics

Limits: Why?

Paper	Times Cited
Shagin DA, Barsova EV, Yanushevich YG, Fradkov AF, Lukyanov KA, Labas YA, Semenova TN, Ugalde JA, Meyers A, Nunez JM et al. . 2004. GFP-like proteins as ubiquitous metazoan superfamily: Evolution of functional features and structural complexity. <i>Molecular Biology and Evolution</i> 21(5):841-850. doi:10.1093/molbev/msh079	165
Joye SB, Boetius A, Orcutt BN, Montoya JP, Schulz HN, Erickson MJ, Lugo SK. 2004. The anaerobic oxidation of methane and sulfate reduction in sediments from Gulf of Mexico cold seeps. <i>Chemical Geology</i> 205(3-4):219-238. doi:10.1016/j.chemgeo.2003.12.019	154
Meyer E, Aglyamova GV, Wang S, Buchanan-Carter J, Abrego D, Colbourne JK, Willis BL, Matz MV. 2009. Sequencing and de novo analysis of a coral larval transcriptome using 454 GSFlx. <i>Bmc Genomics</i> 10. doi:10.1186/1471-2164-10-219	113
Baums IB, Miller MW, Hellberg ME. 2005. Regionally isolated populations of an imperiled Caribbean coral, <i>Acropora palmata</i> . <i>Molecular Ecology</i> 14(5):1377-1390. doi:10.1111/j.1365-294X.2005.02489.x	107
Proskurowski G, Lilley MD, Seewald JS, Fruh-Green GL, Olson EJ, Lupton JE, Sylva SP, Kelley DS. 2008. Abiogenic hydrocarbon production at Lost City hydrothermal field. <i>Science</i> 319(5863):604-607. doi:10.1126/science.1151194	107

Most highly cited OER-supported articles as of 02 July 2012

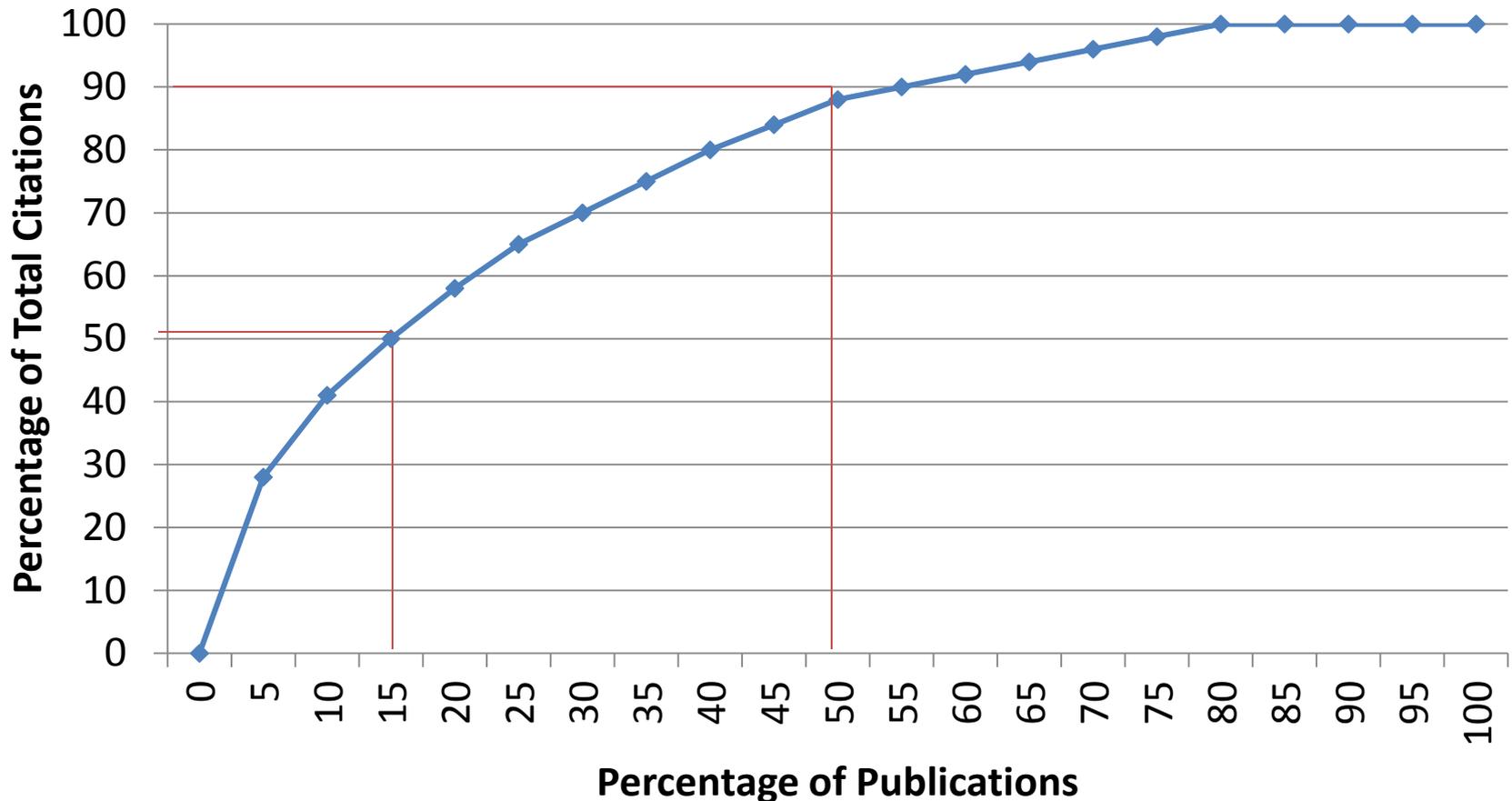
Limits: Why?



Limits: What Do Citations Mean?

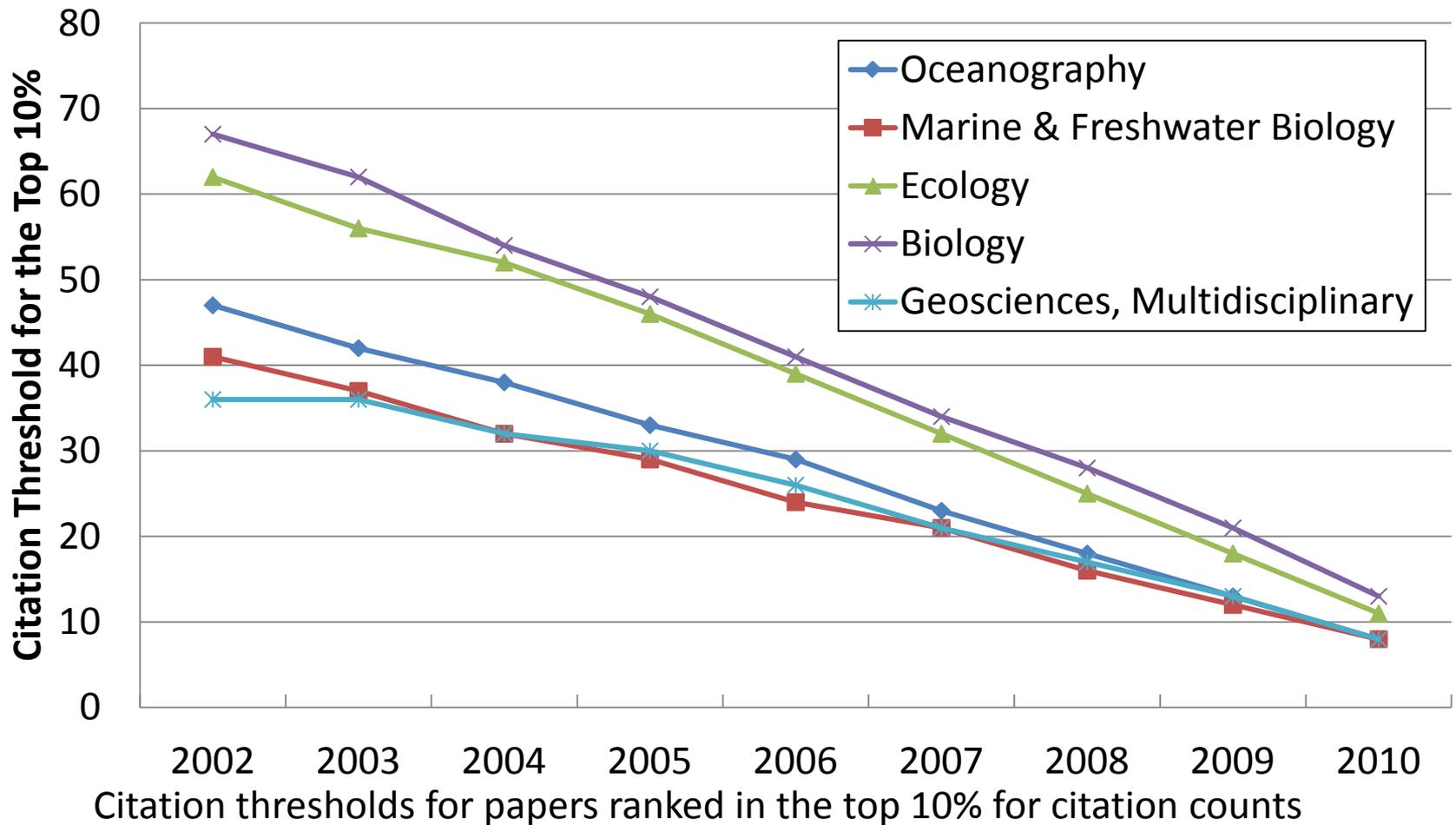
- Measure influence?
- Measure significance?
- Measure applicability?
- Measure something else?

Limits: Citation Distributions



Adapted from: Seglen PO. 1992. The skewness of science. *Journal of the American Society for Information Science* 43(9):628-638

Limits: Citation Distributions



Limits: Measuring Publications

- Bibliometrics can only measure some publications
- Bibliometrics might measure a few data sets, software tools, technical reports...
- Bibliometrics cannot measure mentoring, editing/reviewing, panel participation, outreach...

How should they be used?

Use: To Complement Peer Review

- Bibliometric analysis has serious limitations
- Peer review also has limitations
- Each method partially corrects for the limitations of the other

Use: To Raise 'Why' Questions

- Although bibliometric analysis cannot answer why questions, it does effectively raise them

- Bibliometrics can detect anomalies or trends that can be addressed by peer review

Conclusion

- Evaluation should balance quantitative and qualitative information
- Bibliometrics cannot replace peer review
- Bibliometrics should complement peer review

Questions?



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