



# Declining impact of (soil) geostatistics?

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At the Pedometrics conference in Tübingen Tom Hengl showed us a graph from a paper in *Scientometrics* on bibliometric analysis of geostatistical papers (Zhou et al., 2007). The multivariate analysis was based on 2866 publications in the ISI database. The articles spanned 107 subject categories and about 13% were on the soil geostatistics. Highest mean impact factor and annual citation per publication were R.M. Lark and P. Goovaerts whereas A. Stein was the most productive author. *Geoderma* ranked third in the top 10 of the most productive geostatistics journal and is together with the *Soil Science Society of America Journal* in the top 5 of the most cited journals. To us, this shows that pedometrics have greatly contributed to geostatistics.

The Zhou et al. paper was not about soil geostatistics but showed that the number of papers and citations is growing over time (1967-2005), but the “impact” of the papers is going down. The impact was measured by average citations per year and mean impact factors and the mean impact factor was calculated based on journals impact factors calculated in 2005. As we all know, there are some problems with these two measures: the first is that citation rate is not constant over time and mostly follows a sigmoidal function, usually it takes more than 1 for a paper to get cited. The second is that there is a large interannual fluctuation in the impact factor of a journal and that the journal’s impact factor holds no relation to individual papers. In many journals the impact factor is determined by only a handful of papers.

The impact factor for a journal (let’s say in 2006) is calculated as follows:

$A$  = Number of citations in 2006 to articles published in 2004-2005

$B$  = Number of papers published in 2004-2005.

The impact factor for year 2006 is  $= A/B$ .

The impact factor can be calculated for different periods e.g. with a two or four year window. Usually, the two-year impact factors are reported and the factors for the preceding year are mostly reported in June (that’s when most publishers, some journal editors and perhaps even some authors get excited).

A better measure for the “impact” of a topic is the impact factor itself, which can be calculated for a topic in the same manner as a journal’s impact factor. We conducted our own bibliometric analysis focusing on soil geostatistics. The ISI Web of Science was used searching for papers with keywords: soil\* and [geostatistic\* or kriging or variogram\*]. This may not be a complete list, but will give a good indication of the bibliographic trend.

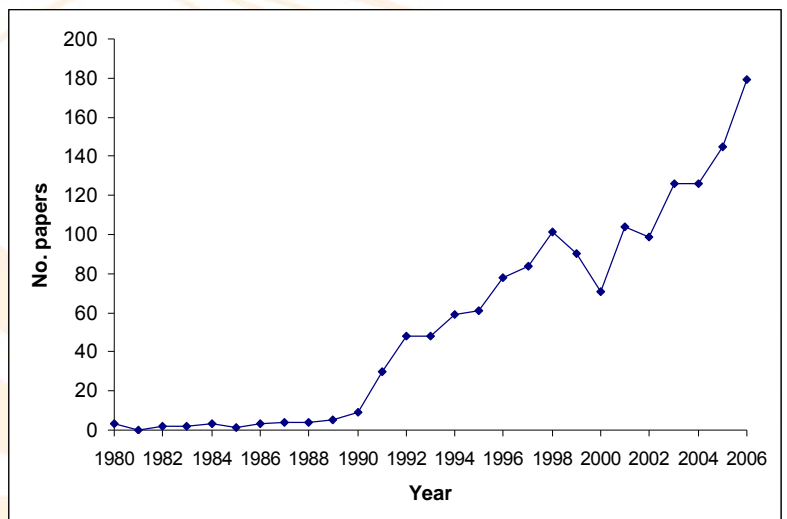


Figure 1. Number of publications in soil geostatistics over time.

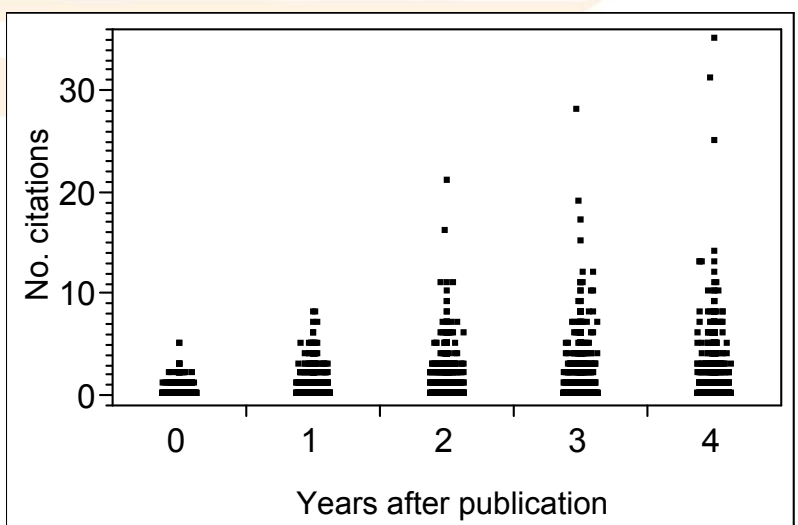


Figure 2. No. citations as a function of number of years after the papers were published.

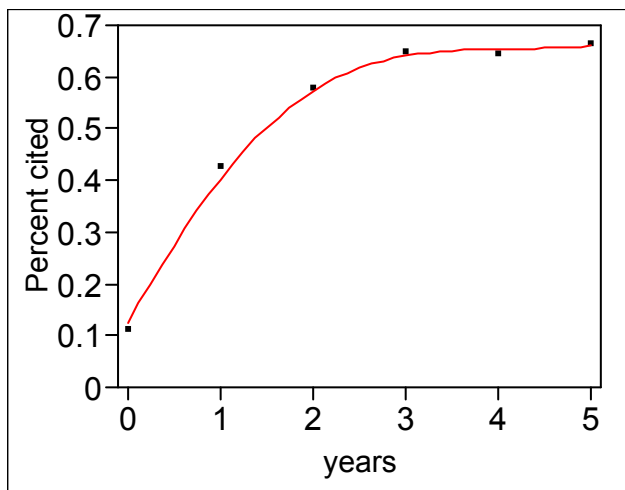


Figure 3. Distribution of percentage of self-citations in Pedometrics papers.

There are 1485 papers published between 1980 and 2006. Fig. 1 shows the increasing number of papers on soil geostatistics and since 1999 the rate of increase is about 13 papers per year. The number of papers drastically increased after 1990. The number before 1991 is underestimated because the ISI databases contain no abstracts prior to 1991. Therefore, we only present impact factor calculations for the years 1991 to 2006 (and we also wonder how Zhou et al. obtained their data).

Figures 2 and 3 show the number of citations as a function of the number of years after the paper was published. For soil geostatistics (and generally in soil science), only 10% of the paper will be cited in the same year as it is published, and after 1 year 42% will be cited. It takes at least 3 years to get two-third of the citations. About 35% of the papers are never cited (*nil desperandum* folks).

The paper with the highest immediacy factor of 4 (number of citations of an article in that year) is from pedometricians:

De Gruijter, J.J.; Walvoort, D.J.J.; van Gaans, P.F.M., 1997. Continuous soil maps - A fuzzy set approach to bridge the gap between aggregation levels of process and distribution models. *Geoderma*, 77: 169-195

We calculated the two-year and four-year impact factors (figure 4). For both there that there is a peak in the 1998, and a slight drop until 2002, where it starts to increase steadily again. The impact factor is around 1, which means on average expect only one citation per year, and for a soil science journals is not high.

Our results showed that soil geostatistics research and “impact” (as measured by citations) is at a steady rate, and seems to contradict the findings of Zhou et al. which showed a declining trend since 2002. That may be good news but overall the impact factor of soil geostatistics is not high.

Tomi has promised that he will do a more thorough analysis on geostatistical analysis of geostatistical publications. As always, we are keen to see that!

## References

Zhou, F., Guo, H.C., Ho, Y.S., Wu, C.Z., 2007. Scientometric analysis of geostatistics using multivariate methods. *Scientometrics* 73, 265-279 . DOI: 10.1007/s11192-007-1798-5.

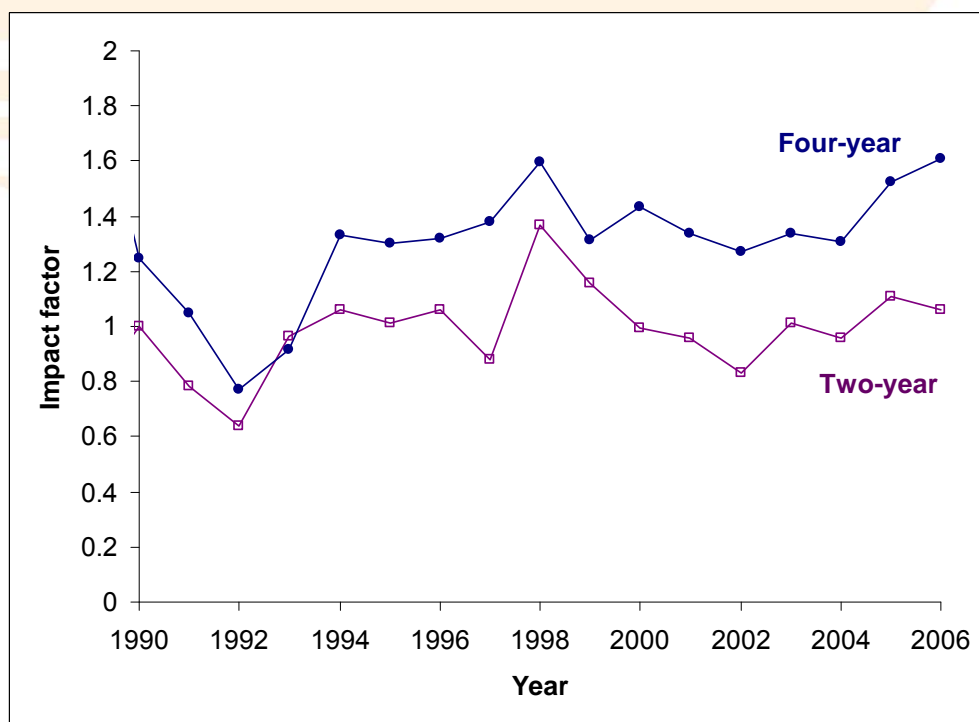


Figure 4. Two-year and Four-year impact factors for soil geostatistics papers.