Meteor stream identification with geocentric variables

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We show that it is possible to use geocentric variables to identify meteoroid streams. The variables we propose exhibit some important advantages over the conventional orbital elements q, e, i, ω and Ω used for many decades for the same purpose in the orbital similarity criterion introduced in 1963 by Southworth and Hawkins: *(i)* they are four, and are directly linked to the four independently measured quantities – the geocentric velocity, the two angular coordinates of the radiant, and the time of the meteor fall – while the five orbital elements are not all independent of each other; *(ii)* two of these four variables are, under appropriate conditions, near-invariant with respect to the main secular perturbations affecting meteoroid orbits, the one related to the cycle of ω.

When applied to a sample of high quality photographic meteor orbits, geocentric variables allow to reproduce the results obtained using Southworth's criterion, but not always: a few loose streams are not recognized, while many new ones are identified; moreover, in many cases the geocentric variables allow to assign more meteoroids to certain streams identified by both criteria.