Attachment to review on:

"DNS (v1.0): An open source ray-tracing tool for space geodetic techniques"

The authors present a ray tracing tool along with a description and validation of its functionality. The manuscript points to new opportunities that can be approached with this tool (high-precision modeling with global coverage). It is certainly an important achievement of interest for the community. Some points should be considered before publication, see here below.

Comments:

- (1) The title seems to be incomplete. Either there, or latest in the abstract, the meaning of "DNS" should be resolved. Furthermore, the authors stress in the manuscript that the tool allows quicker computations than before and that the number of computations can be increased up to an "application on global scale". This aspect could be reflected in the title and abstract.
- (2) The analysis in sections 3.6 and 3.7 leaves an open question. How are the parameters, presented in Fig. 9, 10, 11, affected on the sub-daily scale? Ionospheric corrections are computed with 1h resolution, however, the plots do not resolve the sub-daily scale. Is there an impact of the daily cycle (local solar incidence) similar to the impact of the solar cycle?
- (3) The state-of-the-art considerations to higher-order ionospheric corrections at the beginning of section 3.7 (line 470-480) are part of the motivation and should appear earlier in the introduction to explain early the goals of the study/tool.
- (4) The word "we" in the manuscript is not precisely used, see especially section 3.7. It refers to the author team of this manuscript, however, it also refers in some places to authors of previous papers!

Minor Comments:

- (a) Line 35: "... tropospheric delay is plugged into the observation equation ...", where can the reader find the observation equation?
- (b) Line 95: "... defined by the point P, the centre of the osculating sphere ...", better to clarify: "... defined by transmitter in point P, the centre of ... and the receiver in point Q".
- (c) Line 125: "... the ZHD from the empirical formula ...", which empirical formula, where to find it?
- (d) Eq. (8): here, \$N\$ is again the refractivity of the neutral gas? Please clarify.
- (e) Line 111 & 183 & 357: clarify why 120 corrections or delays are computed, 6 azimuth

bins x 10 elevation bins x ??

- (f) Line 195: please, explain the meaning of ds = dg.
- (g) Line 219: ECMWF data are defined on "137 pressure levels".
- (h) Line 263: "... ionosphere indicates if space-weather is switched on/off", does it mean that a background ionospheric climatology is always switched on and only space-weather effects can be switched?
- (i) Line 28: correct typo "... to run these cases ..."
- (j) Captions of Fig. 2 & 3: clarify that "differences between RADIATE and DNS" are shown.
- (k) Line 363 & 365: the gradients involve azimuth \$a\$ and elevation \$e\$, then different indices \$i\$, \$j\$ should be used, respectively, to run through all bin combinations!?
- (I) Line 373: sentence is unclear, maybe better: "standard deviation of ZTDs and gradient components considering the difference of DNS and RADIATE results ..."

(m)Captions of Fig. 4, 5 & 6: maybe clearer: "Root mean square (scatter) of ..."

- (n) Line 428: resolve the meaning of "... BVPs.".
- (o) Line 440: clarify origin of "... same 2592 grid point coordinates ..." lat bins x lon bins!?
- (p) Line 473: rather "There, ..." than "In fact, ..."
- (q) Line 497: provide a short explanation of "standard elevation angle dependent down weighting"
- (r) Line 552: maybe less casual: "... the NeQuick2 model source code because it provides this solution quickly."