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NOTE ON A DISCUSSION ABOUT THE ION COMPOSITION

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Referring to a paper presented at a topical session on IRI during the 1982 (Ottawa) General Assembly of COSPAR /1/, Ph. repeated the following conclusions which had been deduced from a very large data base obtained in the 150 to 500 km height range by the S3-1 satellite.

(1) Main molecular ions (NO^+, O_2^+): Below 170 km the ratio $[NO^+]/[O_2^+]$ is always > 1. Also at higher altitudes, it is almost constant over a large height range, but NO^+ prevails by day (summer) while O_2^+ does so by night (winter).

(2) The transition height between molecular ions and atomic O^+ occurs normally between 170 and 200 km, but can be as high as 400 km during magnetically di.turbed periods.

(3) The N^+ density follows that of O^+ at a constant ratio of about 0.5 to 2% by day, but becomes insignificant below 200 km by night.

(4) Between 150 and 220 km the relative ion denisty profiles established with the satellite data differ from IRI; this latter had been established with the Danilov-Semenov compilation of rocket results /2/.

(5) Quite generally, the solar zenith angle plays a major role and might even be used at night.

Statement (4) is illustrated by an example shown in Figs. 1 a, b, which should be compared with the IRI modelling presented in Fig. 2. Not only is the $[NO^+]/[O_2^+]$ ratio different from that given by IRI, but there appears to be a much stronger variation of the total percentage of the molecular ions in the 160 to 220 km height range. Therefore, the transition height (50% of O^+) occurs at a lower level (170 instead of 190 km). Thus, the new data base in a height range which was not too well covered earlier should lead to a reconsideration of the present IRI description.

Ph. still intends to represent his data by a new descriptive model which might then be incorporated into IRI.

Finally, he gave strong arguments in favour of a basic change in the descriptive schedule. Instead of primarily modelling O^+ and O_2^+ as does the actual IRI, he proposes to model NO^+ and O_2^+ at lower, and H^+ and He^+ at higher levels, and to fill up to 100% with O^+. In doing so, the descriptive formulas would be easier to establish since they would have a simple variation with height and the particularly characteristic species would be directly modelled.

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