A GLOBAL FIT OF THE $X^3\Sigma_g^-$, $a^1\Delta_g$, $b^1\Sigma_g^+$ AND $B^3\Sigma_u^-$ STATES OF THE SIX ISOTOPOLOGUES OF OXYGEN

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A global fit of the six isotopologues of the O_2 molecule has been carried out, with the purpose to support the current and future Earth remote sensing missions. All previously available experimental data from the following systems were collected and used in the analysis: the microwave transitions in the $X^3\Sigma_g^-$ and $a^1\Delta_g$ states, the infared transitions from the $a^1\Delta_g - X^3\Sigma_g^-$, $b^1\Sigma_g^+ - X^3\Sigma_g^-$, and $b^1\Sigma_g^+ - a^1\Delta_g$ systems, the UV transitions from the $B^3\Sigma_u^- - X^3\Sigma_g^-$ Schumann-Runge system. For the main $^{16}O_2$ isotopologue, experimental data are available for the following vibrational states: $v = 0-18$ for $X^3\Sigma_g^-$, $v = 0-1$ for $a^1\Delta_g$, $v = 0-17$ for $b^1\Sigma_g^+$, $v = 0-17$ for $B^3\Sigma_u^-$. A band by band fit was first carried out for these $^{16}O_2$ data to check bad measurements, misassigments and calibration problems. Then all these $^{16}O_2$ data were fitted with a Dunham-type model. It was found that most $^{16}O_2$ data (98%) could be fitted within 3 times experimental accuracies in the band by band fit; the $X^3\Sigma_g^-$, $a^1\Delta_g$, $b^1\Sigma_g^+$ states could be well reproduced with the Dunham-type model; but the vibrational energies for $v = 0-17$ of $B^3\Sigma_u^-$ could not be fitted well with the Dunham-type mode, probably caused by the known perturbations in this state. A band by band fit has been performed for each of the other five minor isotopologues, and a Dunham-type fit is in progress for these data. Eventually data from all the six isotopologues will be simultaneously fitted with a multi-isotopologue Dunham model. We will present the most recent fitting results to date.