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Assessment of high (diurnal) to low (seasonal) frequency variations of isoprene emission rates using a neural network approach

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Abstract. Using a statistical approach based on artificial neural networks, an emission algorithm (ISO-LF) accounting for high to low frequency variations was developed for isoprene emission rates. ISO-LF was optimised using a data base (ISO-DB) specifically designed for this work, which consists of 1321 emission rates collected in the literature and 34 environmental variables, measured or assessed using National Climatic Data Center or National Centers for Environmental Predictions meteorological databases. ISO-DB covers a large variety of emitters (25 species) and environmental conditions (10° S to 60° N). When only instantaneous environmental regressors (instantaneous air temperature $T0$ and photosynthetic photon flux density $L0$) were used, a maximum of 60% of the overall isoprene variability was assessed with the highest emissions being strongly underestimated. ISO-LF includes a total of 9 high (instantaneous) to low (up to 3 weeks) frequency regressors and accounts for up to 91% of the isoprene emission variability, whatever the emission range, species or climate investigated. ISO-LF was found to be mainly sensitive to air temperature cumulated over 3 weeks ($T21$) and to $L0$ and $T0$ variations. $T21$, $T0$ and $L0$ only accounts for 76% of the overall variability.

▣ Final Revised Paper (PDF, 902 KB)   ▣ Discussion Paper (ACPD)

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