Observed and simulated global distribution and budget of atmospheric C_2-C_5 alkanes

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The primary sources and atmospheric chemistry of C_2-C_5 alkanes have been incorporated into the atmospheric chemistry general circulation model EMAC (ECHAM5/MESSy Atmospheric Chemistry). Model output is compared with new observations from the NOAA/ESRL GMD cooperative air sampling network. Based on the global coverage of the data, two different anthropogenic emission datasets for C_4-C_5 alkanes, widely used in the modelling community, are evaluated. We show that the model reproduces the main atmospheric features of the C_2-C_5 alkanes (e.g., seasonality). While the simulated values of ethane and propane are within a 20% range of the measurements, larger deviations are found for the other tracers. Finally the effect of C_3-C_5 alkanes on the concentration of acetone and acetaldehyde are assessed. Their chemical sources are largely controlled by the reaction with OH, while the reactions with NO_3 and Cl contribute only to a little extent.