

# Producing realistic atmospheres for radio simulations of extensive air showers using GDAS

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The LOFAR radio telescope measures the radio emission from extensive air showers with unprecedented precision. Estimating the depth of shower maximum  $X_{\max}$  with higher precision is of great interest for the study of primary particle composition. One of the major systematic uncertainties in reconstructing  $X_{\max}$  is due to limited knowledge of the refractive index of air and its dependence on humidity, pressure, and temperature. This calls for the inclusion of real atmospheric data at the time of the air shower at a given observational site into the monte carlo air shower simulation codes like CORSIKA/CoREAS. Using The Global Data Assimilation System (GDAS), a global atmospheric model based on meteorological measurements and numerical weather predictions we have implemented realistic refractive index along with real time atmospheric profiles in CORSIKA/CoREAS, which is available since the latest release. We present the results from re-analyzing LOFAR cosmic-ray data with new improved atmospheres.

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