

EGU2020-2580

<https://doi.org/10.5194/egusphere-egu2020-2580>

EGU General Assembly 2020

© Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.



Estimates of anthropogenic CO₂ emissions from satellite and ground based measurements

Yury Timofeyev¹, George Nerobelov¹, Sergey Smyshlyaev², Ivan Berezin¹, Yana Virolainen¹, Maria Makarova¹, Anatoly Poberovsky¹, Alexander Polyakov¹, and Stefania Foka¹

¹Saint-Petersburg State University, Saint-Petersburg, Russian Federation (y.timofeev@spbu.ru)

²Russian State Hydrometeorological University, Saint-Petersburg, Russian Federation (smyshl@rshu.ru)

In recent years, satellite methods have played an important role in CO₂ monitoring. Various satellite instruments (SCIAMACHY, AIRS, GOSAT, OCO-2, etc.) validated by ground-based and aircraft measurements allow to retrieving the column averaged CO₂ mixing ratio (X_{CO_2}) with high accuracy (0.25–1.0%). The relatively high spatial resolution of a number of instruments (for example, OCO-2) allows studies of spatial and temporal CO₂ variations, that, under appropriate conditions, makes it possible to estimate anthropogenic emissions from different cities.

Various techniques (source pixel mass balance method, plume dispersion model and atmospheric inversion system) for determining anthropogenic greenhouse gas emissions from data of satellite measurements are considered.

On the basis of three-dimensional modeling and comparison with the results of various local and remote measurements, numerical models of the atmosphere were adapted to different megacities of Russia. Based on numerical experiments, the errors of various satellite techniques for determining emissions caused by various factors (measurement errors, quality of used a priori and additional experimental information, adequacy of used numerical atmospheric model, etc.) were evaluated. Anthropogenic CO₂ emissions in St. Petersburg, Moscow and other cities of Russia are estimated using various satellite measurements. These estimates of anthropogenic emissions are compared with data obtained by different methods and for different cities.