

EGU21-7005

<https://doi.org/10.5194/egusphere-egu21-7005>

EGU General Assembly 2021

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Inverse analysis of fire-induced carbon emission from Equatorial Asia in 2015 with CONTRAIL and NIES-VOS data

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The fire-induced carbon emission in Equatorial Asia was estimated using the inverse system named NICAM-based Inverse Simulation for Monitoring (NISMON) carbon dioxide (CO₂). The analysis was performed with the four-dimensional variational method for 2015, when the big El Niño was occurred. NISMON-CO₂ extensively used high-precision atmospheric mole fraction data of CO₂ from the commercial aircraft observation project of Comprehensive Observation Network for TRace gases by AirLiner (CONTRAIL). Furthermore, independent atmospheric CO₂ and carbon monoxide data from National Institute for Environmental Studies (NIES) Volunteer Observing Ship (VOS) Programme were used to elucidate the validity of the estimated fire-induced carbon emission. Finally, using both CONTRAIL and NIES-VOS CO₂ data, the inverse analysis indicated 273 Tg C for fire emission during September - October 2015. This two-month-long emission accounts for 75% of the annual total fire emission and 45% of the annual total net carbon flux within the region, indicating that fire emission is a dominant driving force of interannual variations of carbon fluxes in Equatorial Asia. In the future warmer climate condition, Equatorial Asia would experience more severe droughts and have risks for releasing a large amount of carbon into the atmosphere. Therefore, the continuation of these aircraft and shipboard observations is fruitful for reliable monitoring of carbon fluxes in Equatorial Asia.