Geophysical Research Abstracts
Vol. 20, EGU2018-14583, 2018
EGU General Assembly 2018

Global Gas Flare Radiative Energy Estimates from the ATSR Sensor Series

Daniel Fisher (1,2) and Martin Wooster (1,2)

(1) King's College London, Geography, United Kingdom (daniel.fisher@kcl.ac.uk), (2) NERC National Centre for Earth Observation (NCEO), UK.

Fairly recent analyses have estimated that gas flaring activities contribute ∼1% of global anthropogenic CO_2 emissions, whilst also releasing air pollutants such as black carbon, sulphur dioxide, nitrogen oxides, and hydrogen sulphide. A number of global initiatives, such as the "Zero Route Flaring by 2030" programme initiated by the World Bank, have been established to encourage nation states to end such wasteful activities. To determine whether such programmes are working towards their end goals regular global surveys of gas flaring activity are required. One suitable approach for the monitoring of gas flares and their emissions at such spatial and temporal scales is through the use of Earth Observations satellites. Various techniques have been developed to determine the radiative heat emissions of gas flares, a measure which has been shown to be correlated to natural gas combustion and carbon dioxide emission rates. Here we present a single channel technique, influenced by the MIR-radiance method developed previously for biomass burning, applied to the Along Track Scanning Radiometer instruments series. The new technique relies on nighttime observations in the shortwave infrared (SWIR) to produce estimates of gas flare radiant emissions, hereafter referred to as the fire radiative power (FRP, in MW) of the flare. Flaring locations are extracted from the nighttime imagery using a dual approach: the first stage assesses the persistence of pixel 'hotspots' through time from the SWIR imagery; the second stage validates any persistent hotspots as gas flares using a ratio between the SWIR spectral radiance and that from the midwave infrared (MWIR). For confirmed hotspots estimates of FRP (MW) are calculated using the single channel algorithm. As gas flares are only observed intermittently effective characterisation of total gas flare emissions from FRP is compromised by cloud cover and seasonal solar illumination differences, and variation in actual flaring activity. Instead, by estimating the total amount of active time of any given flare, as the ratio of times seen active to total times seen, it is possible to generate estimates of fire radiative energy (FRE, in MJ) for a gas flare over its lifetime (the time first seen to the time last seen by the sensor) from the mean of the observed FRPs. These FRE estimates provide an estimate of flaring activity that is less affected by sampling characteristics, along with uncertainties derived from the variance in the FRP estimates, and are used to assess temporal trends of flaring activity both globally and at the nation state level to assess whether progress is being made towards reduced global gas flaring activity.