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The effects of the Syrian civil war on atmospheric NH₃ as seen from IASI

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The Syrian civil war started in 2011, with dramatic social, political, economic, and environmental consequences over the whole area of Syria and nearby countries. Agriculture, in particular, suffered massively. Several studies used satellite-retrieved data and imagery to examine the spatio-temporal changes in the region, due to the civil war. For instance, open-source satellite imagery could show the damage in urban areas, and provide an estimate of the number of people affected by the crisis.

In this study, we investigate the impacts of the Syrian civil war on atmospheric ammonia (NH₃) emitted from industrial and agricultural activities during the 2008-2019 period. Our analyses are based on the NH₃ measurements from the IASI instruments onboard the Metop satellites. Firstly, land-use changes and a decrease in agricultural emissions are explored over the country. We also investigate the changes in atmospheric NH₃ over an ammonia plant, which activities have been suspended due to several conflict-related events. We show that the NH₃ columns retrieved from IASI are directly affected by the war, and those periods of intense conflict and siege are reflected in lower NH₃ concentrations, which are not driven by meteorology. The interpretation of the identified changes in atmospheric NH₃ is supported by the analyses of NO₂ columns from GOME-2 as well as satellite imagery and land cover data. The latter is used to highlight the change in croplands' area over the years, and the satellite images are used to show the activity of the ammonia plant.