Towards a Novel Integrated Approach for Estimating Greenhouse Gas Emissions in Support of International Agreements

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In the Paris Agreement the community of signatory states has agreed to limit the future global temperature increase compared to pre-industrial times to a maximum of +2.0 °C. To achieve this goal, emission reduction targets have been submitted by individual nations (called Nationally Determined Contributions, NDCs). Inventories will be used for checking progress towards these envisaged goals. These inventories are calculated by combining information on specific activities (e.g. passenger cars, agriculture) with activity-related, typically IPCC-sanctioned, emission factors – the so-called bottom-up method. These calculated emissions are reported on an annual basis and are checked by external bodies by using the identical method.

As second, independent method emissions can be estimated by translating greenhouse gas measurements made at regionally representative stations into regional/global emissions using meteorologically-based transport models. In recent years this so-called top-down approach has been substantially advanced into a powerful tool and emission estimates at the national/regional level have become possible. This method is already used in Switzerland, in the United Kingdom and in Australia to estimate greenhouse gas emissions and independently support the national bottom-up emission inventories within the UNFCCC framework. Figure 1 shows a comparison between emissions of HFC-125 from the Swiss greenhouse gas inventory and from a measurement-based method. Examples of the comparison of the two independent methods will be presented and the added-value will be discussed.

The World Meteorological Organization and partner organizations are currently developing a plan to expand this top-down approach and to expand the globally representative Global Atmospheric Watch (GAW) network of ground-based stations and remote-sensing platforms and integrate their information with atmospheric transport models. This Integrated Global Greenhouse Gas Information System (IG^{3}IS) initiative will help nations to improve the accuracy of their country-based emissions inventories and their ability to evaluate the success of emission reductions strategies. This could foster trans-national collaboration on methodologies for estimation of emissions. Furthermore, real-world information on emissions will build up trust between different countries.

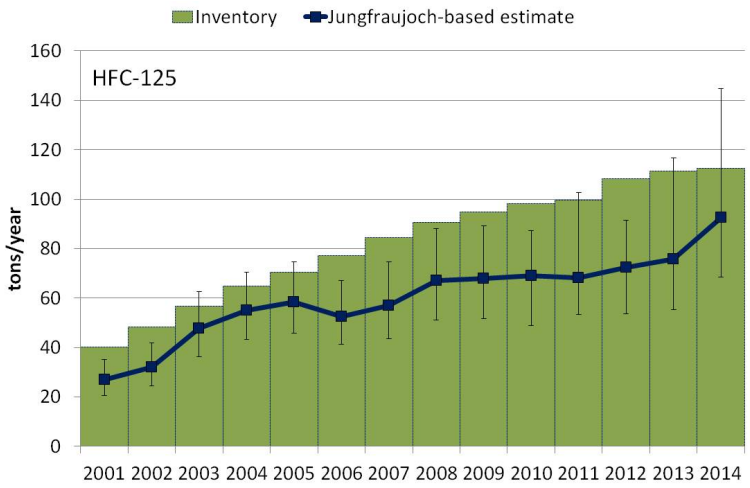

Figure 1. Comparison between emissions of HFC-125 from the Swiss greenhouse gas inventory and from a measurement-based inversion method, using data from Jungfraujoch in conjunction with meteorological transport models.