SPECIAL PROJECT PROGRESS REPORT

All the following mandatory information needs to be provided. The length should *reflect the complexity and duration* of the project.

Reporting year	2019
Project Title:	FLEXPART transport simulations and inverse modelling of atmospheric components
Computer Project Account:	spnoflex
Principal Investigator(s):	Espen Sollum
Affiliation:	NILU- Norwegian Institute for Air Research
Name of ECMWF scientist(s) collaborating to the project (if applicable)	
Start date of the project:	2017
Expected end date:	2019

Computer resources allocated/used for the current year and the previous one

(if applicable)
Please answer for all project resources

		Previous year		Current year	
		Allocated	Used	Allocated	Used
High Performance Computing Facility	(units)	100000	58361.53	100000	0
Data storage capacity	(Gbytes)	150	150	150	150

Summary of project objectives (10 lines max)

The Lagrangian particle dispersion model FLEXPART is run on ECMWF data to explore the transport and dispersion of various atmospheric constituents from greenhouse gases, aerosols like black carbon to volcanic ash released during eruptions. The model is used with various inversion techniques to infer emission estimates of many atmospheric compounds. This helps improving transport simulations of these substances and to understand their contribution and effects on the climate system.

Summary of problems encountered (10 lines max)

Summary of plans for the continuation of the project (10 lines max)

ECMWF data will be continued to be used within the various inversion frameworks for estimating greenhouse gas emissions, radionuclide emissions and volcanic emissions, and subsequent FLEXPART transport simulations using the inverted sources.

List of publications/reports from the project with complete references

Kylling, A., C.D. Groot Zwaaftink, and A. Stohl (2018), 'Mineral dust instantaneous radiative forcing in the Arctic', Geophys. Res. Lett., 45, doi:10.1029/2018GL077346

Summary of results

If submitted **during the first project year**, please summarise the results achieved during the period from the project start to June of the current year. A few paragraphs might be sufficient. If submitted **during the second project year**, this summary should be more detailed and cover the period from the project start. The length, at most 8 pages, should reflect the complexity of the project. Alternatively, it could be replaced by a short summary plus an existing scientific report on the project attached to this document. If submitted **during the third project year**, please summarise the results achieved during the period from July of the previous year to June of the current year. A few paragraphs might be sufficient.

We report on our efforts to quantify the instantaneous radiative forcing (IRF) in the Arctic of the dust from high-latitude sources and compare it with the IRF of dust from low-latitude sources.

Mineral dust sources at high and low latitudes contribute to atmospheric dust loads and dust deposition in the Arctic. We quantify the annual-mean radiative forcing (RF) in the Arctic to be 0.225 W/m 2 at the top of the atmosphere. The largest contributions are from dust transported from Asia south of 60 ∘ N and Africa. High-latitude (> 60 ∘ N) dust sources contribute about 39% to top of the atmosphere RF and have a larger (1 to 2 orders of magnitude) impact on RF per emitted kilogram of dust. Mineral dust deposited on snow accounts for nearly all of the bottom of the atmosphere RF of 0.135 W/m 2 . More than half of the bottom of the atmosphere RF is caused by dust from high-latitude sources, indicating substantial regional climate impacts rarely accounted for in current climate models.