Wind LIDAR Observations from ADM-Aeolus - Validation, Study of Atmospheric Dynamics and Surface Reflectance, and Assimilation Experiments Using a Numerical Model

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The global observation of atmospheric wind profiles remains one of the highest priority needs for weather forecasting. ESA decided to implement the Atmospheric Dynamics Mission ADM-Aeolus to demonstrate the potential of the Doppler LIDAR technology for global wind profiling in order to improve the quality of future numerical weather prediction. ADM-Aeolus will carry the first wind LIDAR in space and launch is currently scheduled for the end of 2013. An airborne prototype of the LIDAR instrument on ADM-Aeolus was developed by DLR (Deutsches Zentrum fur Luft- und Raumfahrt) and deployed in several field campaigns on the DLR Falcon aircraft.

A ground-based direct-detection wind LIDAR was developed at OUC and deployed during several field campaigns, including the sailing competition within the Olympic Games in 2008 in Qingdao. The first project objective is to validate the ADM-Aeolus wind, cloud and aerosol data products and to exploit the Aeolus wind observations for the study of atmospheric dynamics. Ground based co-located measurements with wind LIDARS during overpasses of Aeolus are foreseen in China and in Central Europe. Further airborne campaigns with the ADM-Aeolus airborne demonstrator are planned over Central Europe and the North Atlantic region. These observations will be extended by data from ground based whole sky imagers (WSIs), which will be used to validate various cloud parameters like cloud-base, height, wind and cloud amount.

The second project objective is to use the ground return from ADM-Aeolus to derive high resolution reflectances (and through modelling the BRDF the spectral albedo) of different surfaces (sea, ice, land, etc.) in the UV. The data obtained will be compared to the data set being developed by the ESA-ADAM project in which a global spectral reflectance data set is created for 10 years (including the UV region). In addition, data from various airborne campaigns performed with the ADM-Aeolus airborne demonstrator will be used for this purpose. The third project objective is the assimilation of ADM-Aeolus and ground-based LIDAR observations into regional weather forecasting models. The impact on the initial conditions and the model parameters will be analysed as well as the impact for the dust aerosol and cloud forecast.

Funding for these activities will be provided by ESA, DLR, UK Space Agency and OUC internal sources and it is planned to apply for external funding on national level and within other ESA programs.

ADM-Aeolus激光测风雷达观测--数据印证，大气动力和表面散射研究，针对数值模型的数据同化研究

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全球风场的观测仍然是当前天气预报模型的迫切需求。ESA已经开始实施大气动力任务ADM-Aeolus，其根本目的就是验证星载多普勒激光雷达技术实现全球风场观测的能力，以改进数值天气预报模型。ADM-Aeolus将搭载国际上第一个多普勒激光雷达系统，并预计于2013年底发射。德国空间中心DLR研制了一套机载演示系统，并利用DLR实验飞机进行了多次飞行实验测量任务。

中国海洋大学研制了一套地基直接探测多普勒激光雷达系统，完成了多次现场测量任务，包括2008年在青岛奥运帆船赛的气象保障服务。该项目的第一个目标就是印证ADM-Aeolus的风场、云、气溶胶的观测数据，并拓展观测数据在大气动力研究中的应用。在卫星观测过境的同时，中国和中欧的地基系统进行通过同步测量。DLR后期将利用机载演示系统进行更多的飞行任务。这些观测数据将能够拓展地基系统的数据库，可以用来印证各方面的云参量，如云底高度，风，云量等。

该项目的第二个目标是利用ADM-Aeolus的地面回波推导UV激光在不同地表的高分辨率反射率（海面、冰面、陆地等）。获取的数据结果可以与ESA-ADAM任务10年来获取的全球光谱反射率数据集进行对比（包括UV波段）。另外，机载演示系统飞行实验获取的表面反射率数据也可以用于该研究。第三个计划目标是进行ADM-Aeolus和地基系统的观测数据与天气预报模型的同化研究，并同时开展初始参量和模型对沙尘气溶胶和云预报模型的影响研究。

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