**SCATTEROMETER WINDS FOR MESOSCALE DYNAMICS**

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Abstract

Several opportunities exist to improve our view on mesoscale dynamics using scatterometer winds. First, a constellation of scatterometers exists, measuring high-resolution winds on several local times a day, which enables the depiction of mesoscale dynamics. An update will be given of the quality, quantity and timeliness of the constellation winds. Second, MetOp-A and MetOp-B both operate an ASCAT scatterometer in tandem, where the left and right swaths of both instruments overlap between 40S and 40N with a time difference of about 50 minutes. Since the convection time scale is about 30 minutes, the subsequent spatial wind fields of the tandem ASCAT swaths, separated by 50 minutes, show unique signatures of the convective systems in the changing surface wind field. These changes are compared to satellite precipitation measurements in order to improve our understanding of the major convective downburst as depicted by the tandem ASCAT scatterometers. In particular in tropical convective areas, the convection downbursts principally affect the air-sea interaction process, but which are not incorporated in global weather and climate models. A third topic is our improved understanding of the scatterometer wind retrieval residual, called MLE, which is basically a measure of the surface wind variability. It will be shown that the MLE is indeed able to depict synoptic and mesoscale fronts, squall lines and convective features, which may aid forecasters in nowcasting extreme weather.

**GEOMETRIC CLOUD MOTION WINDS IN A CONVOY OF SATELLITES**

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Abstract

To investigate the potential that spacecraft constellations and formations present for Earth Observation, three ESA “Earth Observation Sentinel Convoy” studies are currently underway as part of the Support to Science Element (STSE) of the Earth Observation Envelope Programme (EOEP) of the European Space Agency (ESA). These studies aim to identify scientific and operational needs that would benefit from additional in-orbit support in three themed domains: ‘Ocean and Ice’, ‘Land’ and ‘Atmosphere’. The studies also intend to identify and develop cost-effective mission concepts that can meet these needs by flying in convoy with the European operational missions, such as MetOp Second Generation (SG). This paper provides an overview of the progress made on the theme ‘Atmosphere’. User needs and identified scientific gaps are outlined and to address these gaps the selected mission concept for further feasibility study is briefly described. To date, mesoscale winds are not well exploited in global NWP and climate models and phenomena of turbulence and convection are not explicitly represented in these models. These phenomena are however initiating atmospheric dynamics and are the basis of the interaction of the troposphere with the surface and stratosphere. The geometric Clouds Motion Winds (gCMW) concept targets the measurement of height-resolved wind fields exploiting the effect of parallax. A multi-angle imaging spectro-radiometer (cf. MISR) is targeted for providing cloud top heights and height-resolved wind, vertical motion, aerosol and cloud structures using a multi-angle imager and geometric optics. Enhanced performance with respect to earlier flown missions may be achieved by 1) launching a tandem of gCMW satellites, e.g., one leading and one following MetOp-SG, 2) allowing night-time measurements by using infrared channels and 3) obtaining winds at several heights by using different visible and infrared frequency channels. This information would greatly complement the MetOp instruments to vertically resolve dynamical structures. The MetOp-SG imagers and sounders would benefit from improved height assignment and cloud information, respectively. To maximise the correlation of images the temporal co-registration between the convoy and MetOp-SG spacecraft should be only a few minutes.

**APPLICATION OF AEOLUS WINDS**

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Abstract

This IWW12 presentation will discuss the challenges of data assimilation and quality assurance of the Aeolus data. The Aeolus Doppler Wind Lidar mission has not been closer to a launch date on any IWW meeting than the one in Copenhagen. The Aeolus instrument will be continuously pulsed at about 50 Hz (CM), whereas it had been designed to emit a burst of laser pulses at 100 Hz every 200 km (BM). Now Aeolus observations will appear in a continuous 2D plane, one dimension in the vertical and the other along the satellite propagation direction. Data assimilation systems are in principle capable of assimilating irregularly-spaced observations and the spatial aggregation of Aeolus data can be optimized to obtain maximum beneficial forecast impact. To this end we determine Numerical Weather Prediction (NWP) model spatial errors statistically using scatterometer, radiosonde and aircraft winds and compare them to synthetically-determined error structures as operationally used in regional and global NWP data assimilation. The spatial NWP errors vary by height, season and climate region and distinct differences are present between the synthetic structures and those determined using observations. Moreover, the effect of spatial representativeness errors will be discussed, which essentially guides the observation thinning and/or aggregation level of observations in data assimilation. We will discuss the consequences of these results for setting the Aeolus vertical and horizontal aggregation and sampling. A second advantage of the continuous mode is in the possibility of continuous monitoring of instrument performance and thus in quality assurance. The talk will briefly address the development of quality assurance of the Aeolus observations in preparation for the forthcoming Aeolus launch.