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Cloud detection with MERIS using oxygen absorption measurements

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A new method to estimate the probability of cloudiness of a MERIS pixel is presented (MERIS is the MEdium Resolution Imaging Spectrometer onboard ENNVISAT). The standard/current Level 2 cloud detection algorithm of the MERIS ground segment (MEGS) is based on a succession of spectral tests that actually uses two obvious spectral properties of clouds: i) clouds are bright and ii) clouds are white. But clouds, as the most variable atmospheric constituent, often show properties that hamper their detection. Thin clouds and partially cloudy pixel show a portion of the underlying surface spectral properties, additionally some surface types, like snow and ice, deserts and sunglint have spectral properties that are similar to spectral properties of some cloud types. However, a very valuable information that can be estimated with MERIS is not yet used: the mean path length of a photon travelling thru the atmosphere. It is evident that the mean path length is for most cloudy cases shorter than for clear cases. The mean path length can be estimated utilizing measurement in the O2A absorption band covered MERIS channel 11. The new cloud detection algorithm uses measurements in this channel in addition to the spectral threshold test. The algorithm is implemented by means of an artificial neural network, which has been trained by the results of numerous radiative transfer calculations. This implementation allows additionally the estimation of a probability of cloudiness which is valuable for many subsequent algorithms. First investigations show that the new cloud detection show in many cases the same clouds as the standard procedure, whereas the identification of clouds over bright surfaces as well as the detection of thin clouds is significantly improved.