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Predictability of cloud fraction in global NWP models

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Accurate prediction of cloudiness is crucial in weather forecasting. Clouds exert a strong feedback on atmospheric flow by modulating energy fluxes and heating rates. Errors in low cloudiness contribute significantly to 2-m temperature errors in the short and medium range. It is investigated how the predictability of cloud fraction depends on cloud type and cloud fraction in different global models using ECMWF's high-resolution and ensemble forecasts, as well as the THORPEX Interactive Grand Global Ensemble (TIGGE) dataset. Results indicate that the skill of a probabilistic forecast of cloudiness exceeds that of a deterministic forecast already at shorter lead times than typically found for other surface or upper-air parameters. Systematic errors in forecasted cloud fraction distributions in different cloud regimes are analyzed in the Atlantic-Euro-African domain using Climate Monitoring Satellite Application Facility (CM SAF) data. Model development at ECMWF has been able to reduce systematic and non-systematic errors in the forecast of cloudiness over the last decade. However, gains in skill have been smaller than for other parameters, possible causes of which are discussed. A significant potential for improvement of forecasts of low cloudiness (stratocumulus, stratus) is identified.