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Melt ponds and marginal ice zone from new algorithm of sea ice concentration retrieval

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Studies of spatial and temporal properties of sea ice distribution in polar regions help to monitor global environmental changes and reveal their natural and anthropogenic factors, as well as make forecasts of weather, marine transportation and fishing conditions, assess perspectives of mineral mining on the continental shelf, etc. Contact methods of observation are often insufficient to meet the goals, very complicated technically and organizationally and not always safe for people involved. Remote sensing techniques are believed to be the best alternative. Its include monitoring of polar regions by means of passive microwave sensing with the aim to determine spatial distribution, types, thickness and snow cover of ice. However, the algorithms employed today to retrieve sea ice characteristics from passive microwave sensing data for different reasons give significant errors, especially in summer period and also near ice edges and in cases of open ice. A new algorithm of sea ice concentration retrieval in polar regions from satellite microwave radiometry data is discussed. Beside estimating sea ice concentration, the algorithm makes it possible to indicate ice areas with melting snow and melt ponds. Melt ponds are an important element of the Arctic climate system. Covering up to 50% of the surface of drifting ice in summer, they are characterized by low albedo values and absorb several times more incident shortwave radiation than the rest of the snow and ice cover. The change of melt ponds area in summer period 1987-2015 is investigated. The marginal ice zone (MIZ) is defined as the area where open ocean processes, including specifically ocean waves, alter significantly the dynamical properties of the sea ice cover. Ocean wave fields comprise short waves generated locally and swell propagating from the large ocean basins. Depending on factors like wind direction and ocean currents, it may consist of anything from isolated, small and large ice floes drifting over a large area to a compact edge of small ice floes pressed together in front of solid pack ice. The marginal ice zone is very dynamic due to the influence of the weather and rapid changes. Changes in its extent may take place over hours or days. The marginal ice zone location from differ algorithms in comparison with visual ship data is presented.