ADEOS-II AMSR Soil Moisture Algorithm

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The soil moisture algorithm involves a series of steps beginning with quality control of the input data followed by re-sampling of the data, surface type classification, screening of the data for retrieval, and inversion of the brightness temperatures to obtain soil moisture. A flowchart of the algorithm is shown in Figure 1.

Re-sampling of the data to an Earth-fixed grid is done to facilitate the surface type classification and retrieval steps. These steps use external data bases to identify water bodies, mountainous areas, soil texture, and other surface features. The surface type classification includes generation of flags that indicate snow, frozen ground, dense vegetation, or precipitation, where retrievals are either not possible or are likely to be of degraded quality.

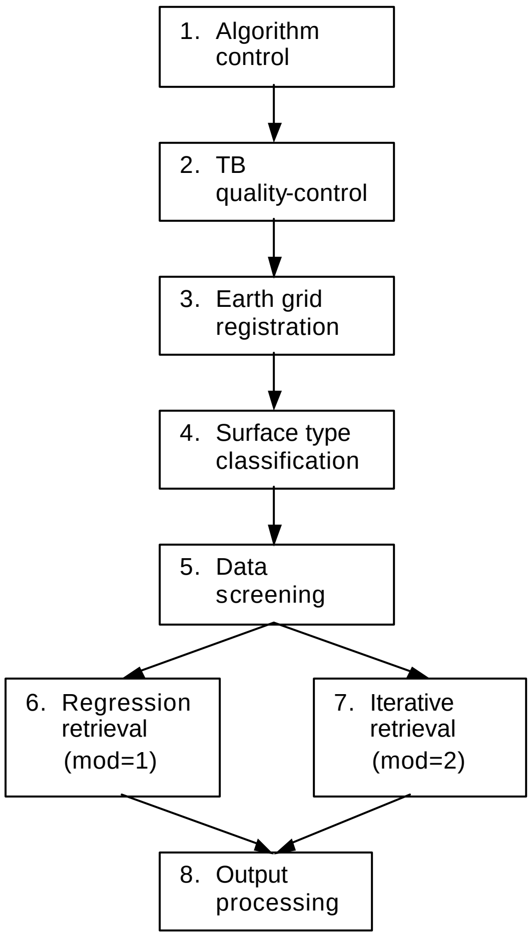

Fig. 1 Flowchart of the algorithm

The surface type flags are qualitative and are generated primarily to assist in screening the data and interpreting the soil moisture retrievals.

The algorithm is a model-based iterative retrieval using the model and approach described in Njoku and Li (1999). This model expresses the brightness temperature observed by AMSR at a particular frequency as:

$$T_{B_p} = T_e \{ (1 - r_{sp}) \exp(-t_c) + (1 - w_p) [1 - \exp(-t_c)] [1 + r_{sp} \exp(-t_c)] \}$$

where, T_e is the surface temperature; r_{sp} is the surface reflectivity, which is related to the volumetric soil moisture m_v through the Fresnel equations; w_p is the vegetation single scattering albedo, and t_c is the vegetation opacity, which is modeled as linearly related to the vegetation water content w_c. Fixed values are used for w_p and surface roughness height (which affects r_{sp}). The algorithm provides internal corrections for T_e and t_c in deriving m_v, through the use of information contained in the multichannel estimation. At each retrieval point the algorithm finds the set of T_e, t_c and m_v that minimize the weighted sum of squared differences between observed and model-computed multichannel brightness temperatures. Weights are used to select among the lowest six channels (6.9, 10.6, & 18 GHz; V & H). A backup algorithm mode uses a regression equation that is empirically based and is implemented as an alternate means for evaluating anomalous situations, such as where the iterative algorithm fails to converge. This mode uses a combination of the six lowest frequency AMSR channels with coefficients derived from Nimbus-7 SMMR data.

Njoku, E. and L. Li, “Retrieval of land surface parameters using passive microwave measurements at 6–18 GHz,” *IEEE Trans. Geosci. Rem. Sens., 37*, 79–93, 1999