Fact Sheet

SNTHERM: 1-D ENERGY BALANCE MODEL FOR SNOW AND SOIL

DESCRIPTION

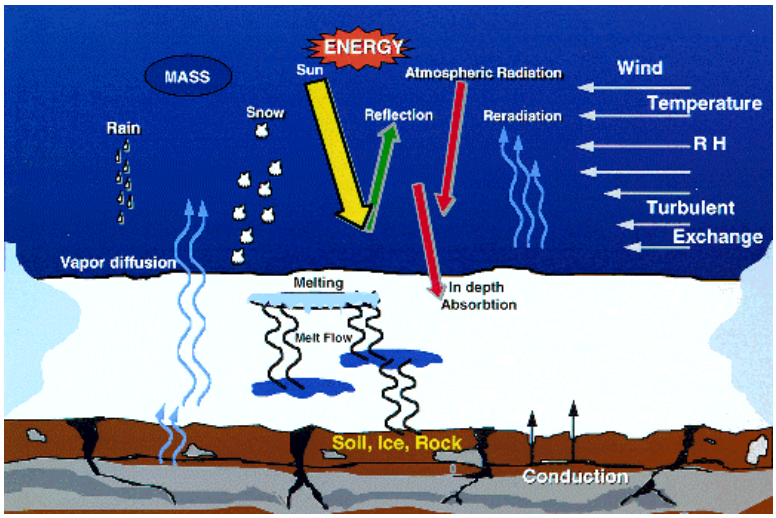
SNTHERM is a physically based snow and soil model that is forced by meteorologically determined surface fluxes. It simulates most in-snow properties and processes, such as heat conduction, water flow, melt, vapor flow, compaction, grain growth, and in-depth solar absorption. As output, it provides snow depth, profiles of snow temperature, water content, density, grain size, and surface fluxes of sensible heat and evaporation. Optionally, it computes fluxes of solar and longwave radiation and albedo. The underlying soil component contains only a thermal equation, and thus models temperature profiles and frost depth, but not water or vapor flow. Any number of user-supplied soil strata or material types are permitted. The code has been publicly available for ten years and is widely used both in the United States and abroad by government agencies, universities, and private industry. SNTHERM is written in FORTRAN-77 and runs on DOS and UNIX platforms. It is validated, flexible, and easy to use.

REQUIRED INPUT

- Air temperature, wind speed, RH, precipitation at six-hour time intervals or less
- Cloud conditions or solar and longwave radiation
- Slope and aspect
- Initial snow and soil temperatures
- Initial snow density and soil moisture
- Soil type or soil characteristics

APPLICATIONS

SNTHERM has been applied to a variety of military and civil programs and has been exercised over a range of global latitudes that experience winter conditions. It is used both as a point model and as input for distributed snow models. SNTHERM has been used operationally to predict snow depth, melt, and runoff for the Sava River Basin and to predict thermal and millimeter wave background characteristics for the former Smart Weapons Operability Enhancement Program.



Using SNTHERM model simulations in conjunction with satellite imagery, the National Weather Service can accurately predict snowmelt in the most remote locations, thus providing a valuable public service. Both as a stand-alone model and in conjunction with global climate models, SNTHERM predicts snow characteristics and surface energy exchange over polar ice caps. The U.S. Department of Transportation is testing SNTHERM for road icing hazard, and SNTHERM has further potential for predicting state-of-the-ground effects on traffic mobility, winter construction, and seismic/acoustic wave propagation.

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