Meteorology Research Project, 2011

UCD Automatic Weather Station: Energy Balance

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The UCD Meteorology & Climate Centre has acquired AWS equipment. The goal of this project is to make use of the data from the AWS at the Rosemount site.

The equipment includes a radiometer, capable of measuring the short and long wave radiation emitted upwards and downwards.

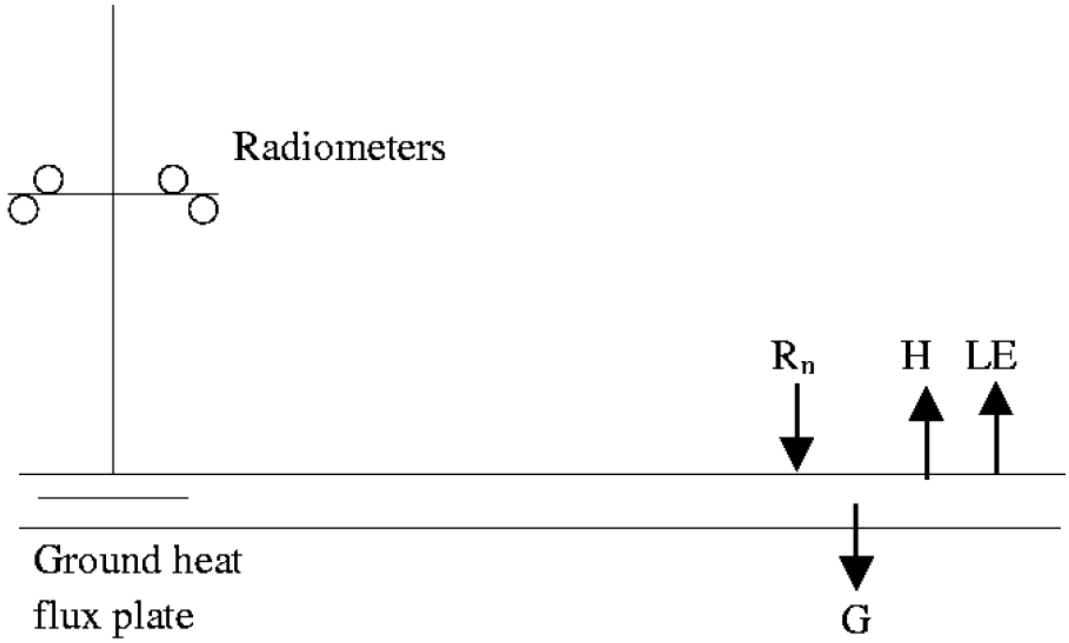

Figure 37 : Schematic diagram of the radiation measurements and the surface energy fluxes.

In conditions of low wind, radiative transfer at the surface of the Earth dominates the production or suppression of turbulence. The heating of the lowest few metres of the atmosphere depends on the heating of the surface and the transfer of heat from the surface into the air. These processes can be quantified by looking at the *surface energy balance*.

The exchange of energy between the Earth's surface layer and its overlying atmosphere involves four important processes, namely:

− Absorption and emission of 'natural' electromagnetic radiation by the surface
− Thermal conduction of heat energy within the ground
− Turbulent transfer of heat energy towards or away from the surface within the atmosphere
− Evaporation of water stored in the Earth's surface layer, or condensation of atmospheric water vapour onto the surface.

Each of these processes can be measured by an associated energy flux density, defined as the rate of transfer of energy across a surface of unit area. In SI units, an energy flux density has units of joules per second per square meter or *J s-1 m-2*, which is the same as Watts per square metre (W m-2).

The student should:

- **Familiarize himself/herself with the equipment that has been purchased and installed**
- **Study the relevant documentation to establish the method of implementing the range of sensors.**
- **Assist in the installation of radiometer equipment on the mast.**
- **Acquire a time series of observational radiation data.**
- **Analyze the surface energy budget under various conditions.**
- **Study the diurnal cycle of the radiation balance.**

The results of the research should be presented in a report.