Estimation of sensible heat flux of a drip-irrigated vineyard using the aerodynamic temperature model in Talca-Chile

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Abstract. A study was carried to evaluate the performance of the general bulk aerodynamic resistance equation to estimate the sensible heat flux (H) of a Merlot vineyard based on the surface aerodynamic temperature method. From 2006 to 2010, field measurements of energy balance components (H, LE, net radiation (Rn) and soil heat fluxes (G)) and meteorological variables (wind speed (u), air temperature (Ta) and relative humidity (RH)) were obtained from a micro-meteorological tower placed in an experimental vineyard of 4.25 ha near Talca, Chile. A three-dimensional (3D) sonic anemometer, installed on the tower, was used to obtain (measured) H. This H was corrected for lack of energy balance closure using the Bowen ratio approach. Finally, the radiometric surface temperature (Ts) was obtained from 21 Landsat scenes (L1T product) for clear cloudy days. Surface aerodynamic temperature (Taero_inv) and surface aerodynamic resistance to heat transfer (rah_inv) were obtained by inverting the bulk aerodynamic equation of H. The model to estimate the vineyard surface aerodynamic temperature (Taero_m) was obtained by a multiple regression technique relating Taero_inv to Ts, u and Ta. Initial results from comparisons of estimated with measured values indicated that surface aerodynamic temperature, surface aerodynamic resistance and sensible heat flux were estimated with a root mean square error (RMSE) of 1.06 ^{o}C, 3.0 s m^{-1} and 52.7 W m^{-2}, respectively.