Geophysical Research Abstracts
Vol. 12, EGU2010-8478, 2010
EGU General Assembly 2010
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Long-term application of winery wastewater - Effect on soil microbial populations and soil chemistry

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The ability to reuse winery wastewater (WWW) has potential benefits both with respect to treatment of a waste stream, as well as providing a beneficial water resource in water limited regions such as south-eastern Australia, California and South Africa. Over an extended time period, this practice leads to changes in soil chemistry, and potentially, also to soil microbial populations. In this study, we compared the short term effects of WWW (both treated and untreated) application on soil biology and chemistry in two adjacent paired sites with the same soil type, one of which had received WWW for approximately 30 years, and the other which had not. The paired sites were treated with an industrially relevant quantity of WWW, and the soil microbial activity (measured as soil CO2 efflux) and common soil physicochemical properties were monitored over a 16-day period. In addition, Solid State 13C NMR was employed on whole soil samples from the two sites, to measure and compare the chemical nature of the soil organic matter at the paired sites. The acclimatised soil showed a high level of organic matter and a greater spike in microbial activity following WWW addition, in comparison with the non-acclimatised soil, suggesting differences in soil chemistry and soil microbial communities between the two sites. Soil nitrate and phosphorus levels showed significant differences between WWW treatments; these differences likely to be microbially mediated.