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Late Holocene records of fire and human presence in New Zealand

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New Zealand, and the South Island in particular, can be considered an excellent test site for the study of the early impact of humans on the environment for two main reasons: the Polynesian settlement occurred only about 700–800 y BP and resulted in abrupt and huge landscape modifications. Burning forest for land clearance impacted dramatically on an ecosystem that was not adapted to fire, changing the composition of the vegetation as documented by sedimentary charcoal and pollen records [1]. Although charcoal data give incontrovertible evidence of some unprecedented fire events right after the arrival of the Māori, its significance as a tracer for local and anthropogenic fire events has been questioned, stressing the need for new markers to confirm and complete the information about human presence and its effective impact [2].

In the present work, faecal sterols and polycyclic aromatic hydrocarbons (PAHs) were individuated as suitable molecular markers and analyzed by GC-MS in a sediment core from Lake Kirkpatrick, located in the Lake Wakatipu catchment at 570 m a.s.l. in the South Island of New Zealand. Coprostanol accounts for about 60% of total sterol content in human faeces, being much less relevant in animal dejections [3]. Together with its degradation product epi-coprostanol, it is well conserved in sedimentary archives and can be highly useful in paleoenvironmental reconstructions of human settlements. PAHs are produced in relevant amounts by combustion in conditions of oxygen depletion, and diagnostic ratios (DR) between specific molecules can be used for inferring fuel and sources [4].

The charcoal record for Lake Kirkpatrick shows major fire episodes around AD 1350, confirmed by corresponding high levels of PAHs ascribable to biomass burning (as further evidenced by DR) at c. AD 1350. Moreover, the same trend is observed also in the fluxes of coprostanol and epi-coprostanol, whose sum results in two peaks at c. AD 1346 and 1351. This finding confirms not only the massive presence of humans in the area and the large use of fire at the time, but also complements and refines the reconstructions enabled by charcoal analysis.

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