

Detailed history of Holocene climate variability in Australia from dust records in peat cores

SAMUEL K. MARX^{1*}, BALZ S. KAMBER²,
HAMISH A. MCGOWAN¹ AND JOHN DENHOLM³

¹The University of Queensland, Brisbane, Australia

²Laurentian University, Sudbury, Canada

³Snowy Hydro Ltd., New South Wales, Australia

(*correspondence: s.marx@uq.edu.au)

We present 8 to 10 Ka long high-resolution records of Australian dust export extracted from peat cores in bogs from Australia's Snowy Mountains and from New Zealand. The dust deposition history is reconstructed from the weight of ash after peat ignition. We then determine the extended trace element chemistry on samples as small as 0.5 mg to discriminate between local sediment and far-transported dust. The origin of long-travelled dust is established using a provenance model to fingerprint the source regions from where dust was entrained [1, 2]. This is achieved by matching the chemistry of dust with that from a database of samples collected from the major dust source regions in Australia (n = 220). This is possible due to the remarkable homogeneity of trace elements within Australia's many inland basins. Variability in the rates and sources of dust deposition through time are used to infer patterns of aridity, and climate variability through the Holocene. In the younger layers of peat, the deposition of anthropogenic aerosols also records a detailed history of European settlement in Australia, tracking early European development and industrialization, as well as the advent of intensive agriculture.

[1] Marx, S.K., Kamber, B.S. and McGowan, H.A., 2005b. Provenance of long travelled dust determined with ultra-trace-element composition: A pilot study with samples from New Zealand glaciers. *Earth Surf. Process. Landf.* **30**: 699-716. [2] Marx, S.K., Kamber, B.S. and McGowan, H.A., 2005a. Estimates of Australian dust flux into New Zealand: Quantifying the eastern Australian dust plume pathway using trace element calibrated ²¹⁰Pb as a monitor. *Earth Planet Sc Lett*, **239**: 336-351.

The model of the conversion pyrrhotine - czomolnokite

A.V. MASHUKOV, V.V. ONUFRIENOK
AND A.E. MASHUKOVA

Siberian Federal University, Krasnoyarsk, Russia

There were investigated the samples in the composition FeS-Fe₆S₇. The samples were prepared by the dry synthesis. The repeated studies were carried out after keeping them for 29 years in atmosphere at 20°C.

The samples containing goetite, pyrite, pyrrhotin, parabutlerite, czomolnokite, were received after influence of atmosphere on metastable phase conditions. The influence of the cation vacancies on the conversion "pyrrhotine - czomolnokite" was considered by calculating the thermodynamic potential using Pauli's quantum statistics. The received formulas link pyrrhotine - czomolnokite equilibrium conditions under different component content regarding (1) and disregarding (2) vacancy interactions (Table 1).

Pyrrhotine	Percentage		
	In X-ray grams	Czomolnokite	
		As calculated	1
96.40	2.04	97.47	156.96
69.60	5.03	66.83	57.12
60.90	4.85	69.08	59.50
26.70	8.38	31.11	32.25
26.00	20.30	18.35	11.97
17.30	10.70	18.20	24.52
15.20	14.80	14.87	17.05
15.30	16.30	16.41	15.30
13.50	39.10	10.00	5.74
12.70	22.30	16.37	10.77
3.58	27.50	5.67	8.52
3.31	54.48	3.13	3.96

Table 1: The parameters of some studied samples

Thereby, czomolnokite percent content is found in direct pyrrhotine content dependency. Cation vacancies play the defining role in these conversions.