Geophysical Research Abstracts,
Vol. 10, EGU2008-A-04906, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-04906
EGU General Assembly 2008

Herbicide fate in an allophanic soil: comparison of several experimental and data analysis techniques

C. Duwig (1), B. Prado (2), E. Raymundo (2), J. Lopez (2), C. Hidalgo (2), K. Müller (3), J. Etchevers (2)

(1) IRD/LTHE, Grenoble, France, (2) Colegio de Postgraduados, Montecillo, Mexico, (3) AgResearch Ltd., Hamilton, New Zealand (celine.duwig@ird.fr / Phone: +33 4 76 82 50 00)

The accurate prediction of pesticide fate in the soil relies on a precise estimation of parameters describing the transport and sorption processes under field conditions. While pesticide in permanent charge soils has been extensively studied, their behaviour in variable charge soils can differ widely because of their unique physico-chemical properties. Allophanic soils from Mexico are subjected to intensive agriculture where 2,4-D and atrazine are commonly applied to corn and other cereals. We sampled the topsoil and subsoil of a Pachic Andosol, variably charged, and rich in organic matter and allophane. We conducted miscible displacement experiments with an inert water tracer (^{18}O) and 2,4-D or atrazine under unsaturated condition. Packed and intact columns were studied under different input concentration and flow rate conditions, and batch experiments were conducted for sorption isotherm. The column breakthrough curves were analysed using two approaches: the method of moments and the least-squares optimization technique with the CXTFIT code. Both methods gave similar dispersion and retardation factor when breakthrough curves were complete. The two pesticides were strongly sorbed in both soil horizons (retardation factor between 6 and 9) and sorption followed a non-linear isotherm. The sorption was attributed to the retention of dissociated 2,4-D by positively charged soil surfaces and to hydrogen bonding as well as complexes formation with the organic matter in the case of atrazine. The retardation coefficients calculated from the batch linearised distribution coefficient were close to the coefficients in the intact columns but lower to those in the packed columns. Packing the soil drastically modified the dispersivity and destroyed rapid flow path-

ways naturally present in the subsoil horizon.