

# Wet Chemistry experiments on the 2007 Phoenix Mars Scout Lander mission: Data analysis and results

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Received 7 May 2009; revised 31 August 2009; accepted 23 September 2009; published 16 January 2010.

Chemical analyses of three Martian soil samples were performed using the Wet Chemistry Laboratories on the 2007 Phoenix Mars Scout Lander. One soil sample was obtained from the top ~2 cm (Rosy Red) and two were obtained at ~5 cm depth from the ice table interface (Sorceress 1 and Sorceress 2). When mixed with water in a ~1:25 soil to solution ratio (by volume), a portion of the soil components solvated. Ion concentrations were measured using an array of ion selective electrodes and solution conductivity using a conductivity cell. The measured concentrations represent the minimum leachable ions in the soil and do not take into account species remaining in the soil. Described is the data processing and analysis for determining concentrations of seven ionic species directly measured in the soil/solution mixture. There were no significant differences in concentrations, pH, or conductivity, between the three samples. Using laboratory experiments, refinement of the surface calibrations, and modeling, we have determined a pH for the soil solution of 7.7(±0.3), under prevalent conditions, carbonate buffering, and P<sub>CO2</sub> in the cell headspace. Perchlorate was the dominant anion in solution with a concentration for Rosy Red of 2.7(±1) mM. Equilibrium modeling indicates that measured [Ca<sup>2+</sup>] at 0.56(±0.5) mM and [Mg<sup>2+</sup>] at 2.9(±1.5) mM, are consistent with carbonate equilibrium for a saturated solution. The [Na<sup>+</sup>] and [K<sup>+</sup>] were 1.4(±0.6), and 0.36(±0.3) mM, respectively. Results indicate that the leached portion of soils at the Phoenix landing site are slightly alkaline and dominated by carbonate and perchlorate. However, it should be noted that there is a 5–15 mM discrepancy between measured ions and conductivity and other species may be present.

Citation: Kounaves, S. P., et al. (2010), Wet Chemistry experiments on the 2007 Phoenix Mars Scout Lander mission: Data analysis and results, *J. Geophys. Res.*, 115, E00E10, doi:10.1029/2009JE003424.