ACCURATE CHEMICAL COMPOSITION OF WILD 2 COMETARY GRAINS BY SR-XRF. Alexandre Simionovici[1], Faustine Grossemy[2], Laurence Lemelle[3], Tristan Ferroir[3], Philippe Gillet[3], Janet Borg[2], Zahia Djouadi[2], Pierre Bleuet[4], Jean Susini[4], [1]LGCA, UJF-CNRS, Observatoire des Sciences de l'Univers de Grenoble, BP 53, 38041, Grenoble, FRANCE, *(alexandre.simionovici@ujf-grenoble.fr),* [2]Institut d'Astrophysique Spatiale, Université Paris XI, 91405 Orsay, FRANCE,[3]LST, UMR 5570 CNRS-ENSL-UCBL, ENS Lyon, 46 allée d'Italie, 69007 Lyon, FRANCE, [4]ESRF, BP 220, 38043, Grenoble, FRANCE

Introduction: This work is part of the NASA Preliminary Examination Team (PET) on Bulk Chemistry investigation of Wild 2 cometary grains brought back to Earth by the Stardust mission [1]. X-rays provide the least destructive yet sensitive penetrating micro-probes, capable of analyzing minute samples embedded in low density collectors, so methods based on Synchrotron Radiation were foremost in the PET analyses.

Experimental Protocols: We have performed measurements on beamlines ID22/ID21 of the ESRF synchrotron in Grenoble, France, devoted to high/low energy microimaging and recorded results on a collection of 6 keystones out of the total of 23 used in the study by several international teams. Terminal particles as well as fragmentation tracks in the aerogel were mapped out with micron resolution, recording total mass composition for elements of $Z \geq 15$ by means of X-ray fluorescence [2], as well as structural information by X-ray diffraction [3]. Using micro-Xanes absorption spectroscopy, we also recorded the S and Fe charge states evolution throughout the track. All these analyses were combined to produce a description of the Wild 2 cometary grains as well as a history of their formation and of the thermal interactions during their slowing down in the aerogel collectors.

Results: The PET work was an ambitious but necessarily preliminary effort due to the time constraints set forth in communicating much-awaited results to the international community. In this work we performed a careful analysis of the PET results with a view of setting clear-cut precision limits as well as describing an accurate method of treating this type of data [4]. Our results partly disagree with the findings of Ishii *et al.* [5] and Lanzirotti *et al.* [6] particularly with respect to the values of the low Z elements composition, severely affected by self-absorption corrections but also to those of the high Z ones. Different treatments applied to the terminal particles and the tracks containing most of the mass record a discrepancy with the PET results and partially solve the S depletion and Cu, Zn and Ga enrichment versus CI meteorites. This methodology is now applied to the Stardust interstellar grains [7] using high resolution nano-imaging [8].

References: [1] D.E. Brownlee *et al.*, 2006, Science 314, 1711-1716. [2] M. E. Zolensky *et al.*, 2006, Science 314, 1735-1739. [3] G. J. Flynn *et al.*, 2006, Science 314, 1731-1735. [4] A. Simionovici, P. Chevallier, 2006, Handbook of Practical X-Ray Fluorescence Analysis, 66-83, Springer. [5] A. Ishii et al., 2008, Meteoritics & Planetary Science 43, Nr 1/2, 215–231. [6] A. Lanzirotti et al., 2008, *Meteoritics & Planetary Science* 43, Nr 1/2, 187–213. [7] A. Westphal *et al.*, 2009, 40th Lunar and Planetary Science Conference, #1786. [8] Pierre Bleuet, Alexandre Simionovici, Peter Cloetens, Rémi Tucoulou, Jean Susini, Laurence Lemelle, Tristan Ferroir, Applied. Physics Letters **92**, 2008, 213111-1–3.