COMETS AS CARRIERS OF ORGANIC MATERIAL TO EARLY EARTH AND EXOPLANETS-INSIGHTS FROM THE COSIMA INSTRUMENT ONBOARD ROSETTA. S. Siljeström[1], H. Cottin[2], M.Hilchenbach[3], N. Fray[2], A. Bardyn[2,4], C. Briois[4], D. Baklouti[5], C. Engrand[6], Y. Langevin[5], J. Paquette[3], O. Stenzel[3], J. Kissel[3] and the COSIMA team, [1]Department of Chemistry, Materials and Surfaces, SP Technical Research Institute of Sweden, 501 15 Borås, Sweden (sandra.siljestrom@sp.se), [2]LISA, UMR CNRS 7583, Université Paris Est Créteil et Université Paris Diderot, Institut Pierre Simon Laplace, F-94000 Créteil, France, [3]Max-Planck-Institut für Sonnensystemforschung, D-37077 Göttingen, Germany, [4]Laboratoire de Physique et Chimie de l'Environnement et de l'Espace, CNRS/Université d'Orléans, F-45071 Orléans, France, [5]Institut d'Astrophysique Spatiale, CNRS/Université Paris Sud, Bâtiment 121, F-91405 Orsay, France, [6]Centre de Sciences Nucléaires et de Sciences de la Matière-CSNSM, CNRS/IN2P3-Univ. Paris Sud, Université Paris-Saclay

Introduction: The study of comets is important for the understanding of the origin of the solar system and life on Earth as comets are considered remains of the early solar system. In addition, comets may have carried water and organic molecules to the early Earth. It is therefore likely that they would also be important carriers of material, including organic, to young habitable planets in other solar systems. Therefore the study of comets is key in not just for the understanding of the development of early Earth but also of young exoplanets.

The COmetary Secondary Ion Mass Analyzer (COSIMA), a miniaturized ToF-SIMS, was one of the instruments onboard the orbiter of the Rosetta mission which accompanied comet 67P/Churyumov-Gerasimenko from mid-2014 to end of September 2016. COSIMA analysed the mineral and organic composition of dust particles that were captured on metallic targets exposed to space.

Results and outlook: From mid-August 2014 to end of September 2016, COSIMA detected more than 30,000 cometary particles of different morphologies. After collection these particles have been imaged with the microscope COSISCOPE, and analyzed by SIMS using an In^+ primary ion source. In this presentation an overview will be given on the results obtained so far by COSIMA. In particular, these results show the presence of a mineral component (mainly dominated by silicates) mixed with solid organic matter in the dust particles emitted by comet 67P/Churyumov-Gerasimenko [1, 2]. This carbon is bound in very large macromolecular compounds, analogous to the insoluble organic matter (IOM) found in the carbonaceous chondrite meteorites [2]. If carbon was delivered to Earth and other habitable planets mainly under this macromolecular form, it might have played a leading role in prebiotic evolution which might have been over looked in classical prebiotic evolution models.

References: [1] Hilchenbach et al. (2016), Astrophysical Journal Letters [2] Fray, N. et al. (2016), Nature.