UPCOMING FAR-ULTRAVIOLET OBSERVATIONS OF 2867 STEINS AND 67P/CHURYUMOV-GERASIMENKO WITH ROSETTA ALICE. L. M. Feaga[1], M. F. A'Hearn[1], J. L. Bertaux[2], P. D. Feldman[3], J. Wm. Parker[4], D. C. Slater[5], A. J. Steffl[4], S. A. Stern[6], M. Versteeg[5], and H. A. Weaver[7], [1]University of Maryland, College Park, MD (feaga@astro.umd.edu), [2]Service d'Aeronomie du CNRS, France, [3]Johns Hopkins University, Baltimore, MD, [4]Southwest Research Institute, Boulder, CO, [5]Southwest Research Institute, San Antonio, TX, [6]National Aeronautics and Space Administration, Washington, DC, [7]Applied Physics Laboratory, Laurel, MD.

Introduction: Alice, NASA's far-ultraviolet (FUV) imaging spectrometer aboard ESA's comet rendezvous mission Rosetta, will characterize the nucleus, coma, and nucleus/coma coupling of its primary target comet 67P/Churyumov-Gerasimenko (C-G). C-G is a relatively active Jupiter Family comet whose perihelion recently (in the last 200 years) decreased from 4 AU down to 1.29 AU [1], exposing its volatile components to warmer temperatures. During its cruise to C-G, Alice will also study two flyby targets, 2867 Steins, an E-type asteroid, and 21 Lutetia, a C-type or atypical M-type asteroid [2].

Since launch on March 2, 2004, Alice has observed several calibration targets including the Earth/Moon system and collected scientific observations of Mars during its flyby [3] and Jupiter. Alice has also acquired data on two comets, C/2002 T7 (LINEAR) and 9P/Tempel 1 in conjunction with Deep Impact [4]. Analyses of these data have proven the capabilities of Alice. We present our upcoming observation plans for Steins and our science objectives for C-G.

Instrument: Alice is a light weight, low-power, low-cost FUV imaging spectrometer [5] with spectral range from 700-2050 Å and spectral resolution of 8-12 Å. The field-of-view is 0.05° x 6.0°, with spatial resolution of 0.05° x 0.3°. The sensitivity threshold is at the milliRayleigh level. Alice is well suited for in situ observations of C-G as it approaches perihelion and nuclear activity begins. Spectral band signatures of parent molecules like CO, absorption features of solar radiation by H_2O and CO_2 as well as emission lines from highly volatile noble gases like Ne and Ar fall within Alice's spectral range.

2867 Steins: During the asteroid flyby on September 5, 2008, the FUV surface reflectance of Steins will be measured at closest approach (CA) and a deep search for an exosphere will be conducted one day prior to CA. Simulated reflectance spectra of possible surface materials on Steins as seen by Alice 1 min before CA are plotted in Figure 1. E-type asteroids are thought to contain sulfides, enstatite and low-iron silicates [6], and sulfides have characteristic FUV signatures which Alice should be able to detect in a 60 sec exposure. Because Steins is the first E-type asteroid (and smallest) to be visited by a spacecraft, these data are unique.

67P/Churyumov-Gerasimenko: We are starting to plan the Alice observing sequences of C-G to incorporate Alice's main science objectives [5]. Rosetta will arrive at C-G in 2014 and Alice will begin monitoring the onset of nuclear activity as C-G approaches perihelion. Alice will study the chemical heterogeneity of the nucleus, production rates of parent molecules, atomic budget of the coma, nucleus/coma coupling, small grains and their photometric properties in the coma and the evolution of the ion tail on many time-scales. Alice will also map the entire nucleus at FUV wavelengths. The composition of the nucleus and outgassed volatiles reveal the thermal history and formation conditions of the comet, and hence the conditions of the solar nebula during the formation of the solar system.

References:

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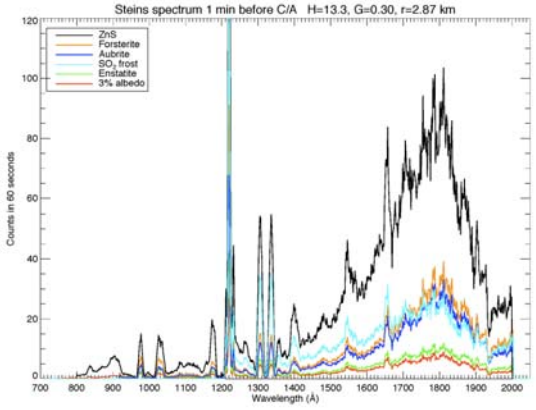

Figure 1: Simulated reflectance spectra of the surface of Steins 1 min prior to CA (60 sec exposure). A representative sulfide, forsterite, aubrite, enstatite, and frost are modeled along with a featureless 3% albedo surface.