SPICE TRAINING SESSION. M. Costa[1], B. Grieger[2], C. Arviset[3], [1]RHEA System for the European Space Agency, ESA/ESAC Camino Bajo del Castillo s/n, Ur. Villafranca del Castillo, 28692 Villanueva de la Canada, Madrid, Spain, marc.costa@esa.int, [2]Aurora Technology B.V. for ESA, [3]ESA.

Introduction: SPICE is an information system that uses ancillary data to provide Solar System geometry information to scientists and engineers for planetary missions in order to plan and analyze scientific observations from space-born instruments. SPICE is developed and maintained by the Navigation and Ancillary Information Facility (NAIF) team of the Jet Propulsion Laboratory (NASA). NAIF and the ESA SPICE Service (ESS) provide SPICE Training Courses on a yearly basis, these are three-day courses which are hosted either nearby Pasadena (California, USA) or nearby Madrid (Spain).

ESS offers a training session on SPICE aimed at scientists and engineers who want to be introduced to SPICE or who might be considering attending a complete SPICE Training.

During this course a brief introduction to SPICE will be provided and it will be followed by a practical hands-on lesson of a SPICE application based on a Mars-Express remote sensing observation scenario. We will also go through WebGeocalc, SPICE-Enhanced Cosmographia 3D Visualization Software and some Python packages**.**

Training Agenda: The seminar is foreseen to have duration of 2 hours. The envisaged agenda for the Seminar will be:

1-Introducing SPICE the cool way: Cosmographia.
2-Cosmographia & WebGeocalc demo
3-Brief introduction to ESS and SPICE Kernels
4-Questions & Answers
5-Remote Sensing Hands-on lesson
6-Questions & Answers and close-out

Training Material: All the training material will be provided with GitHub, using the ESS account: https://github.com/esaSPICEservice/ material will be provided as reference documents and with Jupyter Notebooks.

Preparatory Concepts: ESA has a number of science missions under development and in operations that are dedicated to the study of our Solar System (i.e. MEX, Rosetta, ExoMars, BepiColombo, Solar Orbiter and JUICE). The Science Operations Centres for these missions, located at the European Space Astronomy Centre (ESAC) in Spain, are responsible for all science operations planning, data processing and archiving tasks, being the essential interface between the science instruments and the spacecraft, and with the scientific community.

From the concept study phase to the day-to-day science operations, these missions produce and use auxiliary data (spacecraft orbital state information, attitude, event information and relevant spacecraft housekeeping data) to assist science planning, data processing, analysis and archiving.

Within the Solar System scientific community, the SPICE information system is the 'de facto' standard for auxiliary data handling and geometry computations, and has been adopted and is extensively used in ESA missions. SPICE is developed and maintained by the Navigation and Ancillary Information Facility (NAIF) of the Jet Propulsion Laboratory (JPL).

The SPICE format includes definitions for orbit, attitude and event information, and the data files describing these categories are called ‘SPICE kernels’. These kernels contain sufficient information to compute derived geometrical or positional values using the existing NAIF SPICE toolkit.

For ESA missions, there are three different sources of SPICE kernels:

- The spacecraft orbit (SPK), attitude (CK) and clock correlation (SCLK) kernels, produced regularly for each mission from Mission Analysis and Flight Dynamics products and spacecraft telemetry.
- Generic kernels, such as planetary constants (PCK), leap seconds (LSK) and ephemerides (SPK), mostly provided by NAIF
- Instrument kernels (IK) and the frames specification kernel (FK), created in collaboration with the Instruments Teams

Contact: You can reach us at our home page spice.esac.esa.int, follow us on Twitter @SpiceESA, send us an email at esa_spice@sciops.esa.int. Alternatively8 you can join the OpenPlanetary Slack channel where we are present.

References: [1] Acton C. (1996) *Planet. And Space Sci., 44,* 65-70. [3] Acton, C. et al., (2017) *Planet. And Space Sci.*