

ISSI International Team #322: Towards a global unified model of Europa's exosphere in view of the JUICE mission

<http://www.issibern.ch/teams/exospherejuice/index.html>

Second Team Meeting

Bern, 12-16 Oct 2015

Agenda

Monday 12 Oct 2015

Existing models of Europa's exosphere and of its interactions with the environment

10:30 - 10:50: *Welcome and Project Outline*, by Christina Plainaki

Presentations of plasma interaction and exosphere models - part 1

10:50-11:10 *Major Shortcomings in Our Understanding of Atmospheric Sources and Losses* by **Tim Cassidy** (to be presented by **Frank Crary**)

11:10-11:30 *Modelling Europa's interaction with Jupiter's magnetosphere: Influence of inhomogeneities in Europa's atmosphere on the plasma environment* by **Aljona Bloeker**

11:30-11:50 *An improved, analytic description of plasma flow past Europa: Finite ionospheric thickness and gradual slowing* by **Frank Crary**

11:50-12:10 *Estimation of the loss rates of the main constituents of Europa's exosphere* by **Alice Lucchetti**

12:10-13:00 **Discussion:** reflections on the models and initial comparison

13:00-14:30: Lunch

14:30-14:50 *The EGEON model - Application to Europa (and Ganymede)* by **Christina Plainaki**

14:50-15:10 *Analytical model of Europa's exosphere based on the EGEON model* by **Anna Milillo** (via web)

15:10-16:00 **Discussion** on model comparison and determination of the improvements required to current models

16:00-16:30 **Coffee break**

16:30-17:30 **Discussion** on model comparison (continued)

Tuesday 13 Oct 2015

Existing exosphere models (continued)

Observational studies update

Model comparison and definition of a global model for Europa's H₂O, O₂, H₂ and minor species exosphere

Presentations of plasma interaction and exosphere models - part 2

9:30-09:50 *UBe Monte Carlo Exosphere Model* by **Audrey Vorburger**

09:50-10:10 *Possibilities of PEP / JUICE to measure Europa's exosphere* by **Peter Wurz**

10:10-10:30 Do we need the DSMC models for the surface-bounded atmospheres of the icy satellites? by **Valery Shematovich**

10:30 -11:30 Continue **Discussion** on model comparison and determination of the improvements required to current models

11:30-12:00 **Coffee break**

12:00-12:20 *HST observations of the oxygen aurora* by **Lorenz Roth**

12:20-13:00 Continue **Discussion** on model comparison

13:00-14:30: Lunch

14:30-14:50 Presentation by **Pontus Brandt** (via web)

14:50-15:10 *Auroral signatures of injections and possible relation to Europa?* by **Katerina Radioti** (to be presented by Christina Plainaki)

15:10-16:00 **Discussion** and assignment of study tasks related to injections - Europa's exosphere correlation

16:00-16:30 **Coffee break**

16:30- 17:30 Continue the **Discussion** on model comparison - tasks assignment

Definition of the **Review paper** outline, assignment of writing tasks and definition of deadlines

Wednesday 14 Oct 2015

Definition of suitable observation strategies for future missions namely JUICE
and NASA Mission to Europa

9:30 -09:50 *Europa's exosphere as the interface between the Jovian environment
and the moon's surface: a key scientific target for JUICE* by **Christina
Plainaki**

09:50-10:10 *Observation of the Jupiter system with the Submillimetre Wave
Instrument (SWI) on JUICE* by **Paul Hartogh**

10:10-11:30 **Discussion** on the definition of suitable observation strategies for
future missions namely JUICE and NASA mission to Europa to
discriminate between the existing exosphere models

11:30-12:00 **Coffee break**

12:00-13:00 **Discussion** on the definition of suitable observation strategies for
future missions

13:00-14:30: Lunch

14:30-16:30 **Discussion** on possible paper on observational strategies with
JUICE

Thursday 15 Oct 2014

Detailed work on model comparison (continued from Tue)

Laboratory studies update

09:30-11:30 **Team Work:** Model comparison focus-in and completion

Completion of the comparison Tables (work continued from the previous meeting)

Definition of a community unified model for Europa's H₂O, O₂, H₂ and minor species exosphere: main physical phenomena to be included, acceptable assumptions and approximations

11:30-12:00 **Coffee break**

12:00-13:00 **Team Work:** Model comparison focus-in and completion

13:00-14:30 Lunch

14:30-14:50 *Realistic ice sputtering experiments for the icy moons of Jupiter - updates and next steps* by **André Galli**

14:50 -16:00 **Discussion:** Assessment of possible sputtering, radiolysis and sublimation experiments required to constrain the models

16:00-16:30 **Coffee break**

16:30-17:30 **Discussion:** The next step - continuation of the Team's activities and future plans

Friday 16 Oct 2015
Overall summary and discussion

09:30 - 11:30 Writing of the minutes of the Second Meeting - Definition of Action
Items

11:30- 13:00 General discussions (TBD)

Additional Information

@ *Team Members*: Note that during the Second Meeting, we will work mainly on the Scientific Objectives G2.1, G2.2, G3.1, G4.1, G5.1 presented in TABLE II of the Science Goals and Deliverables document.

TABLE II: Team involvement and responsibilities

Science Objectives	Team members involved	Leading Team member	Deliverable	Expected Project Outcome #
G1.1. Summary of the available UV and VIS observations of Europa's exosphere	Cassidy, Grassi, Radioti, Roth, Plainaki, Saur; <i>Mangano, Retherford</i> Lucchetti	Roth and Saur	DEL#1: TR_G1_1	
G1.2. Summary of the Galileo Radio occultation and Plasma Wave Instrument observations and their implications in Europa's exosphere	Dandouras, Hartogh, Jia, Plainaki, Saur; <i>Retherford</i> Blöcker	Jia	DEL#2: TR_G1_2	
G1.3. Summary of the Cassini/MIMI observations of Europa's extended neutral torus	Dandouras, Plainaki, <i>Milillo,</i>	Dandouras	DEL#3: TR_G1_3	
G1.4. Search for potential data sets synergies and assessment of related variability	Cassidy, Dandouras, Grassi, Hartogh, Jia, Radioti, Roth, Plainaki, Saur; <i>Mangano, Retherford</i> Blöcker Lucchetti	Radioti	DEL#4: TR_G1_4	
G2.1. Review of the existing models simulating Europa's exosphere	Cassidy, Jia, Mura, Plainaki, Roth, Saur, Shematovich, Wurz; <i>Milillo, Orsini</i> Blöcker Lucchetti	Cassidy	DEL#5: TR_G2_1	
		Shematovich	DEL#6: SM_G2_1	(1)
G2.2. Determination of the main improvements required to current models and definition of the required improvements for numerical techniques	Cassidy, Jia, Mura, Plainaki, Roth, Saur, Shematovich, Wurz; <i>Milillo, Orsini</i> Blöcker	Wurz	DEL#7: TR_G2_2	
G3.1. Definition of a community unified model for Europa's H ₂ O, O ₂ , H ₂ and minor species exosphere: main physical phenomena to be	Cassidy, Dandouras, Grassi, Hartogh, Jia, Mura, Plainaki, Radioti, Roth, Saur, Shematovich, Wurz;	Plainaki	DEL#8: TR_G3_1	(1)

included, acceptable assumptions and approximations.	<i>Milillo, Orsini</i> <i>Blöcker</i> <i>Lucchetti</i>			
	Cassidy, Dandouras, Grassi, Hartogh, Jia, Mura, Plainaki, Radioti, Roth, Saur, Shematovich, Wurz; <i>Mangano, Milillo,</i> <i>Orsini, Retherford;</i> <i>Blöcker</i> <i>Lucchetti</i>	Plainaki	DEL#9: Submission of a review paper in peer reviewed journal	(2)
G4.1. Assessment of possible sputtering, radiolysis and sublimation experiments required to constrain the models.	Grassi, Mura, Plainaki, Saur, Shematovich, Wurz	Mura	DEL#10: TR_G4_1	(4)
G5.1. Definition of suitable observation strategies for future missions namely JUICE and Europa Clipper to discriminate between the existing exosphere models.	Dandouras, Grassi, Hartogh, Jia, Mura, Radioti, Roth, Wurz; <i>Mangano,</i> <i>Retherford</i> <i>Lucchetti</i>	Wurz, Hartogh and Retherford	DEL#11: TR_G5_1	(3)

Core Team Members: Aljona Bloecker, Tim Cassidy, Iannis Dandouras, Davide Grassi, Paul Hartogh, Xianzhe Jia, Alice Lucchetti, Alessandro Mura, Christina Plainaki, Aikaterini Radioti, Lorenz Roth, Joachim Saur, Valery Shematovich, Peter Wurz

Extended Team Members: Pontus Brandt (JHU/APL, USA), Frank Crary (Univ. of Colorado Boulder, US), André Galli (Univ. of Bern, Switzerland), Philippe Garnier (IRAP, France), Valeria Mangano (IAPS, Italy), Melissa McGrath (SETI, USA), Anna Milillo (IAPS, Italy), Stefano Orsini (IAPS, Italy), Kurt Retherford (SWRI, USA), Ben Teolis (SWRI, USA), Audrey Vorburger (Univ. of Bern, Switzerland)