

Supporting Information for "The tails of the satellite auroral footprints at Jupiter"

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Introduction Data sets S1 to S6 provide lists of locations of the footprints main Alfvén wing (MAW) spot for all images of the Hubble Space Telescope campaign dedicated to the observation of the Far-UV aurorae of Jupiter from 1997 to 2014 with the Space Telescope Imaging Spectrograph (STIS) and the Advanced Camera for Surveys (ACS). There is one file per satellite (Io, Europa and Ganymede) and per hemisphere (North and South). STIS time-tag sequences have been divided into 90s long sub-exposures. The uncertainty on the location of the spot depends essentially on the uncertainty on the determination of Jupiter's center on the images, which is determined using a limb fitting method [Bonfond *et al.*, 2009]. The provided uncertainties in latitude and longitude assume an uncertainty on the location of the center of the spot of 3 pixels for ACS and 8 pixels for STIS. Only ACS points are used for the Io footprint, because of the number of the detections and their relatively even distribution in System III makes the addition of less accurate STIS detections unnecessary. The assumed projection altitude is 900 km above the 1 bar level for the Io and Europa footprints and 400 km for the Ganymede footprint [Bonfond *et al.*, 2009]. Data sets S7 to S12 provide a best fit contour of these footprint locations. The fit is done by converting the longitude and latitude coordinates into polar coordinates centred in the 185° S_{III} longitude and 74° latitude point in the North and 32° S_{III} longitude and -82° latitude in the South. Then, Fourier series are fitted to the relationship between 1) the satellite longitude and the newly defined polar angle and 2) the relationship between the newly defined polar angle and the distance to the newly defined pole. The coordinates of the fits are finally converted back into System III longitudes and planetocentric latitudes. Results of these fits can be found in Figures S1 and S2.

Data sets S13 and S14 contain the coordinates of the reference oval of the main emission for February and June 2007, respectively, corresponding to a contracted and expanded states of the main oval. Details on this data set can be found in Bonfond *et al.* [2012]. The only difference between the present ovals with the ovals drawn in the paper of Bonfond *et al.* [2012] is the use of the updated rotation rate

of Jupiter when computing the ephemeris, which creates a shift of $\sim 1^\circ$ longitude. The old ovals were generated by using the NAIF (Navigation and Ancillary Information Facility) ephemeris planetary constants kernel *pck00007.tpc*. The present ovals are computed using the the latest kernel *pck00010.tpc* in which the rotation rate of Jupiter has been revised after the 2009 International Astronomical Union report [Archinal *et al.*, 2011]. These kernels can be found on the NAIF website (naif.jpl.nasa.gov).

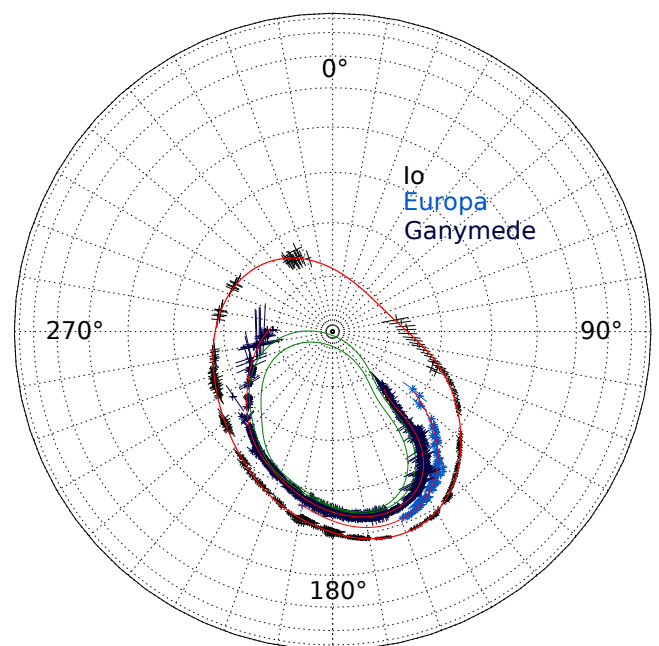


Figure 1. Positions of the Io (black), Europa (pale blue) and Ganymede (dark blue) footprints in the northern hemisphere. The red curves are the reference contours fitting these positions. The inner and outer green curves are the main emission reference ovals from Bonfond *et al.* [2012], corresponding to the mean main oval location in February (contracted oval) and June (expanded oval) 2007.

Data Set S1. Tabulated position of the Io footprint main Alfvén wing spot in the northern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planetocentric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

Data Set S2. Tabulated position of the Io footprint main Alfvén wing spot in the southern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planetocentric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

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Data Set S3. Tabulated position of the Europa footprint main Alfvén wing spot in the northern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planeto-centric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

Data Set S4. Tabulated position of the Europa footprint main Alfvén wing spot in the southern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planeto-centric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

Data Set S5. Tabulated position of the Ganymede footprint main Alfvén wing spot in the northern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planeto-centric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

Data Set S6. Tabulated position of the Ganymede footprint main Alfvén wing spot in the southern hemisphere. The first column is for the image rootname, the second is for the date at the center of the (sub-)exposure, the third are for the System III longitude and planeto-centric latitude of the spot. Fifth and sixth columns provide the uncertainty range on the longitudes and the seventh and eight columns provide the uncertainty range on the latitudes.

Data Set S7. Reference contour for the Io footprint in the northern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S8. Reference contour for the Io footprint in the southern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S9. Reference contour for the Europa footprint in the northern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S10. Reference contour for the Europa footprint in the southern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S11. Reference contour for the Ganymede footprint in the northern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S12. Reference contour for the Ganymede footprint in the southern hemisphere. The first column is for the satellite System III longitude, the second column is for the footprint System III longitude on the planet et the third one is for the planeto-centric latitude of the footprint.

Data Set S13. Coordinates of Jupiter’s main emission reference oval from HST/ACS FUV observations from February 2007 (contracted oval) [Bonfond et al., 2012]. The first two columns are for the northern hemisphere and the last two are for the southern hemisphere. The first and third column are for the System III longitude and the second and fourth ones are for the planetocentric latitudes.

Data Set S14. Coordinates of Jupiter’s main emission reference oval from HST/ACS FUV observations from June 2007 (expanded oval) [Bonfond et al., 2012]. The first two columns are for the northern hemisphere and the last two are for the southern hemisphere. The first and third column are for the System III longitude and the second and fourth ones are for the planetocentric latitudes.

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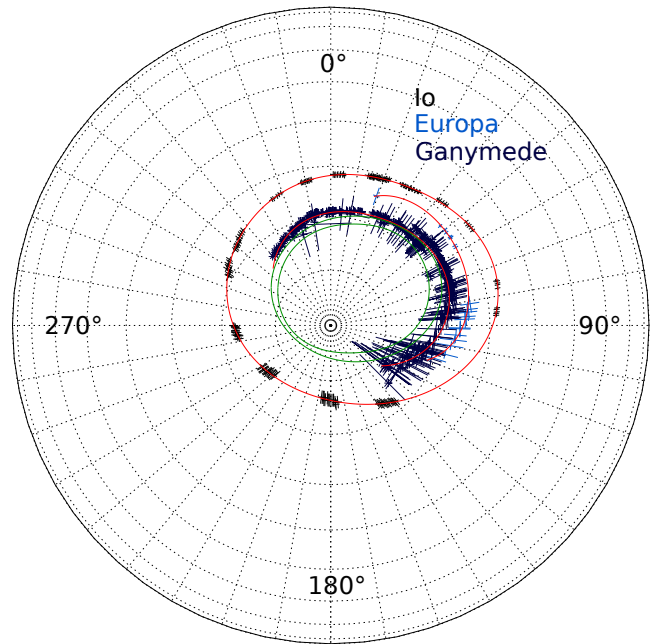


Figure 2. Positions of the Io (black), Europa (pale blue) and Ganymede (dark blue) footprints in the southern hemisphere. The red curves are the reference contours fitting these positions. The inner and outer green curves are the main emission reference ovals from Bonfond et al. [2012], corresponding to the mean main oval location in February (contracted oval) and June (expanded oval) 2007.