

A 2-dimensional Data Detrending Technique for Equatorial Plasma Bubble Studies Using GOLD Far Ultraviolet Observations

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Introduction

Here we supply some additional materials to help illustrate the workings of the rolling-ball data detrending technique, as well as a potential application of the detrended GOLD FUV images in which the structures of elongated depletions due to equatorial plasma bubbles (EPBs) are much more visible in terms of contrast relative to ambient surroundings.

Two different versions of EPB structure animation are given. One illustrates the 3-dimensional EPB morphology using isosurface, and the other illustrates the 3-dimensional EPB morphology using continuous color on several translucent planes. The first version offers a sharper contrast at the EPB boundary, while the latter shows EPB structures that appear more blended/diffuse. In both animations, the camera angle is shifted back-and-forth to show a full view of the EPBs.

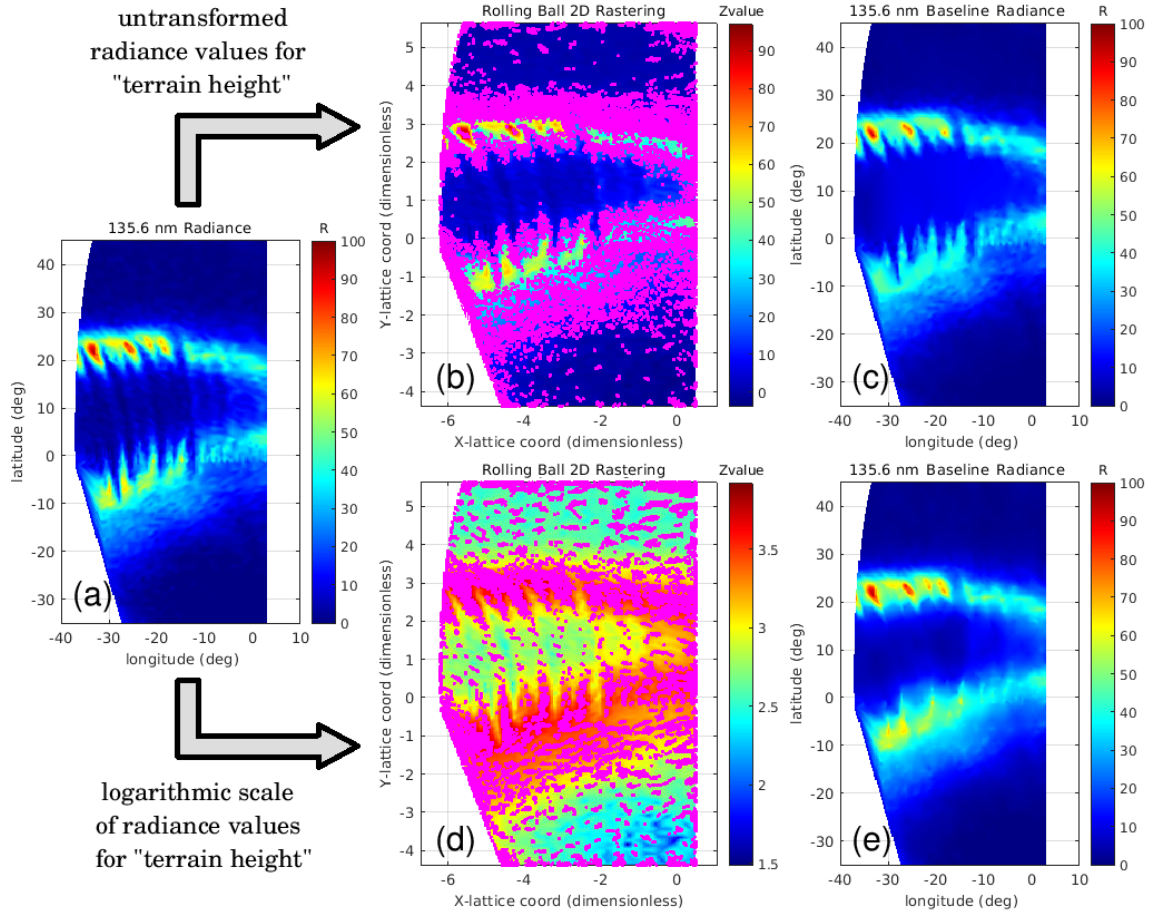


Figure S1. (a) Original nighttime GOLD 135.6 nm radiance profile. (b) Scaled terrain profile and contact points of the rolling ball if untransformed radiance was used for the "terrain height", and (c) the inferred baseline radiance. (d) Scaled terrain profile and contact points of the rolling ball if logarithmic variable transformation/scaling was used for the "terrain height", and (e) the inferred baseline radiance.

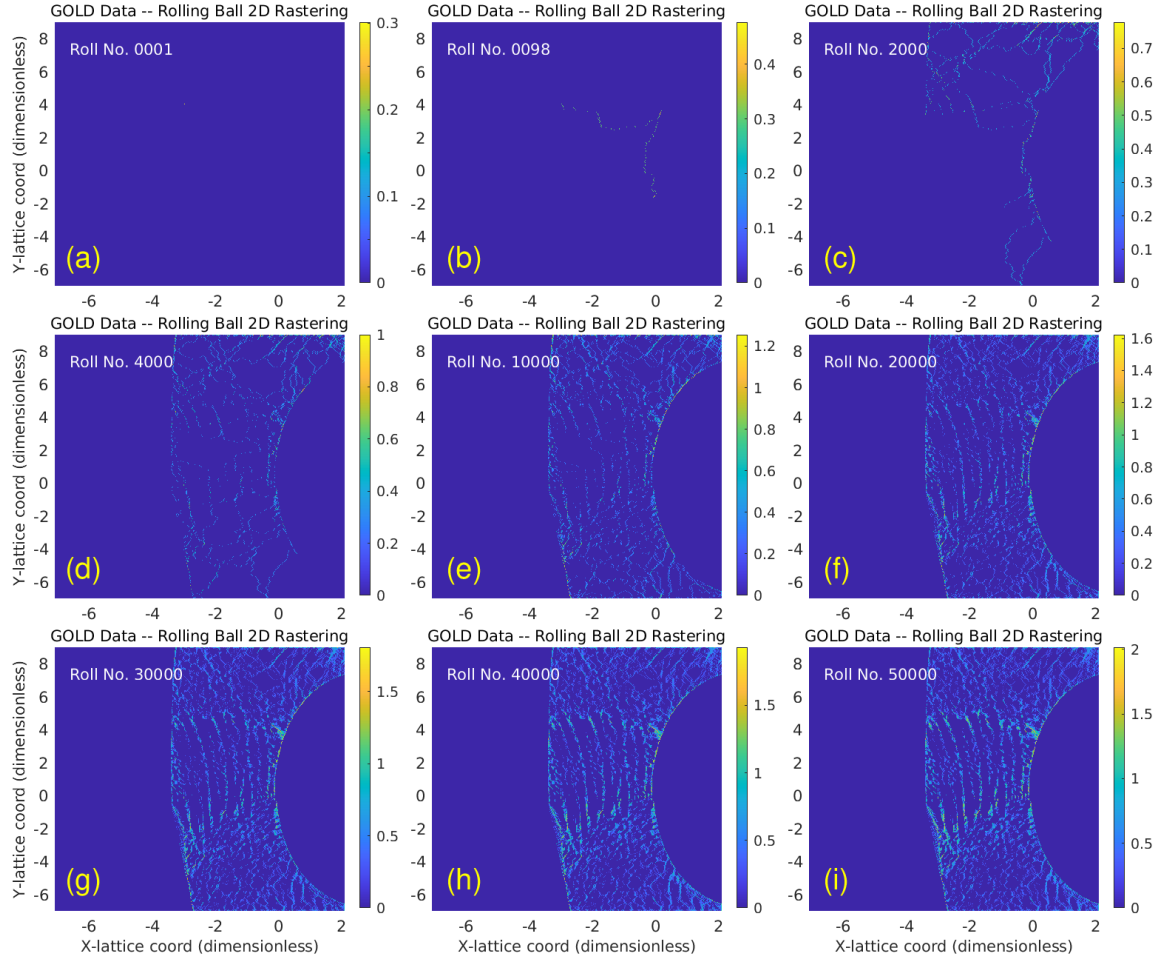


Figure S2. Sample progression of contact points by the rolling ball over the terrain surface for increasing number of rolls. Colormap indicates the number of times (in logarithmic scale) any particular contact point have been visited (or re-visited) by the rolling ball.

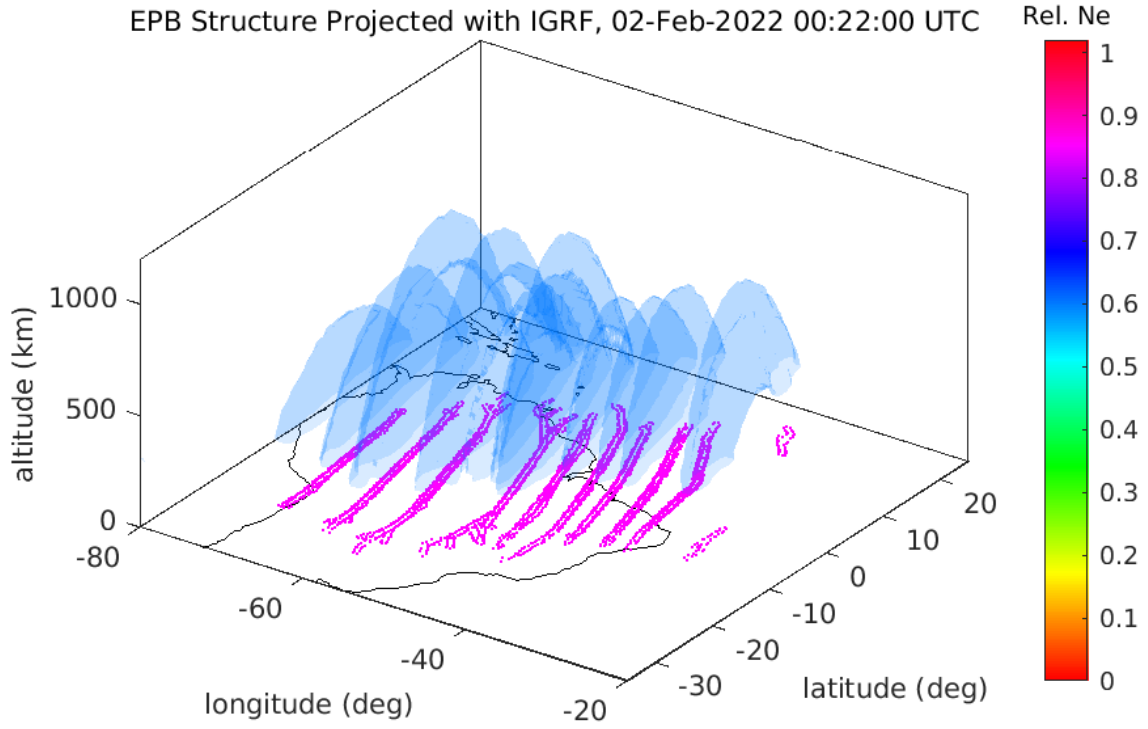


Figure S3. Snapshot from Movie S1 showing a 3-dimensional view of the EPB morphology.

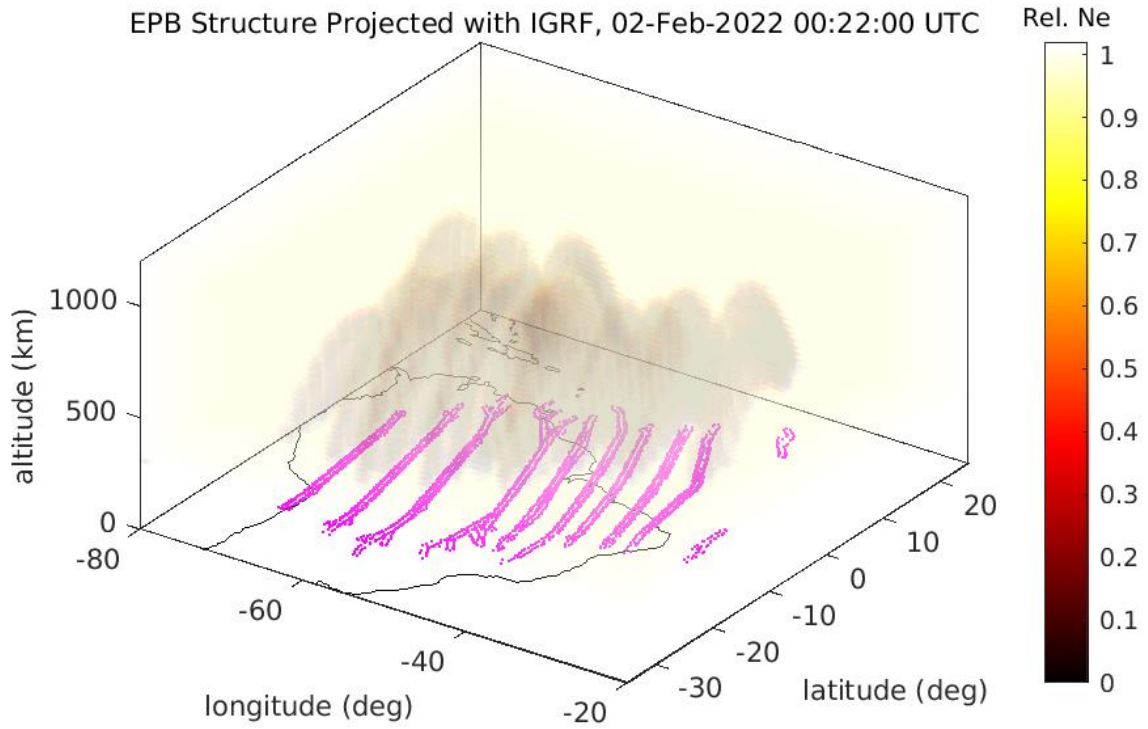


Figure S4. Snapshot from Movie S2 showing a 3-dimensional view of the EPB morphology.

Movie S1. An animation showing the 3-dimensional volumetric configuration of EPBs over the South American / West Atlantic longitude sector, reconstructed based on detrended GOLD FUV image and the IGRF model, from several different viewing angles. These EPB plume structures were from observation at one epoch (00:22 UTC) on 2 February 2022. In the graphics, the EPBs are represented as a series of arches in a light blue color, and the ambient surrounding is shown as white/blank space. The light blue color corresponds to isosurface of relative plasma density selected at 0.6 level (i.e. 40% depletion).

Movie S2. An animation showing the 3-dimensional volumetric configuration of EPBs over the South American / West Atlantic longitude sector, reconstructed based on detrended GOLD FUV image and the IGRF model, from several different viewing angles. These EPB plume structures were from observation at one epoch (00:22 UTC) on 2 February 2022. Here, the darker colors represent depleted part of ionospheric plasma corresponding to EPBs (colormap indicates the relative plasma density value where 1 is unperturbed and zero is fully depleted).