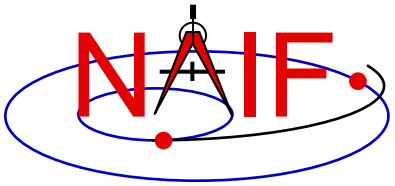

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Geometric Event Finding Programming Lesson (MEX)

October 2022

Geometric Event Finding: Overview

- **Problem statement:**
  - Determine when the Mars Express orbiter (MEX) is visible from the DSN station DSS-14 , within the time interval

    2004 May 2 TDB

    2004 May 6 TDB
  - For the spacecraft to be considered visible, the apparent spacecraft position relative to DSS-14 must have elevation of at least 6 degrees in the DSS-14 topocentric reference frame DSS-14_TOPO.
    - » Use light time and stellar aberration corrections to compute the spacecraft position relative to DSS-14.
  - Account for possible occultation of the spacecraft by Mars, using an ellipsoidal shape model and a DSK shape model.
  - Compute a SPICE window representing the visibility period.
  - Display the start and stop times of each time interval in this SPICE window.

Mars Shape

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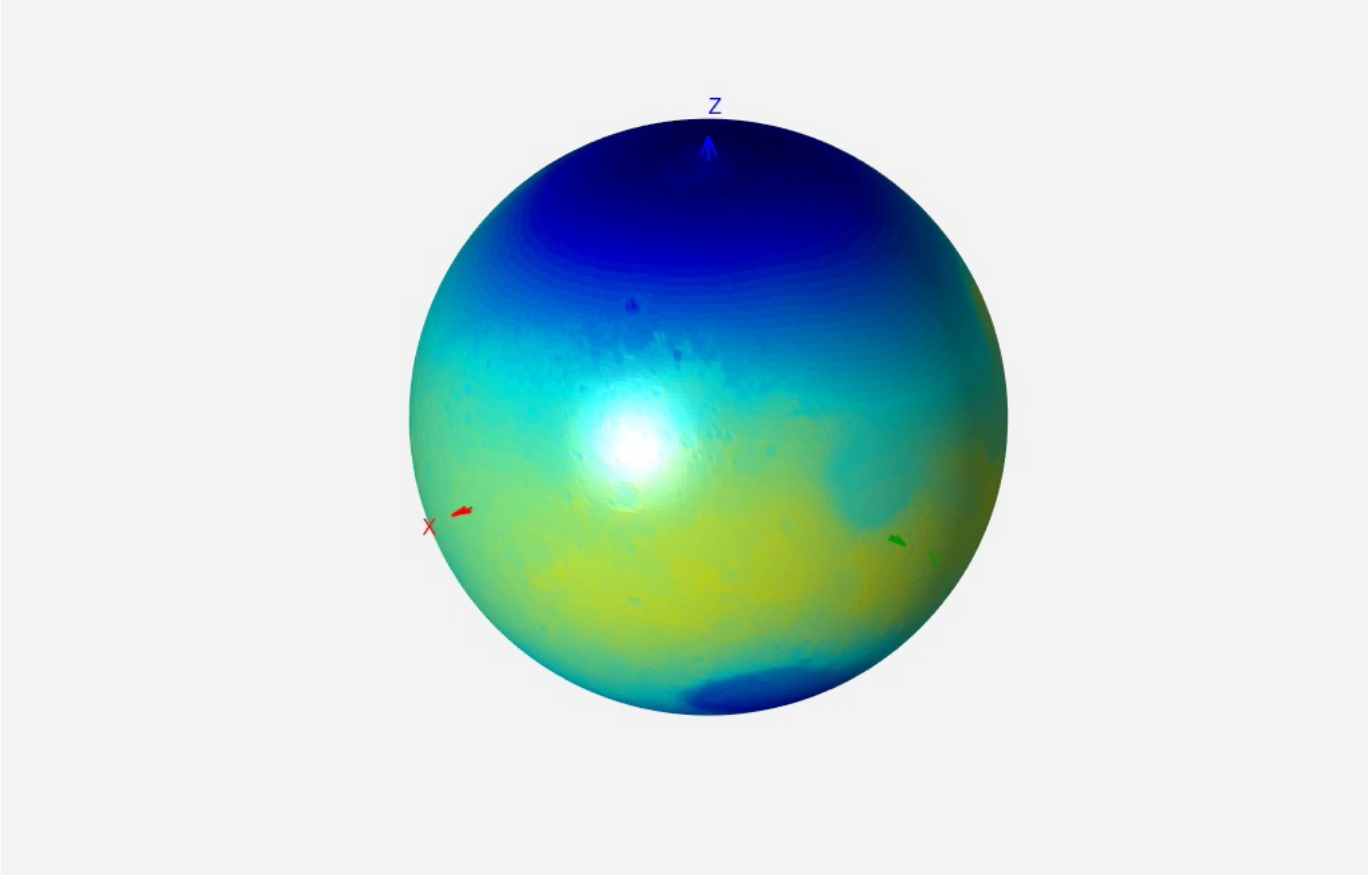
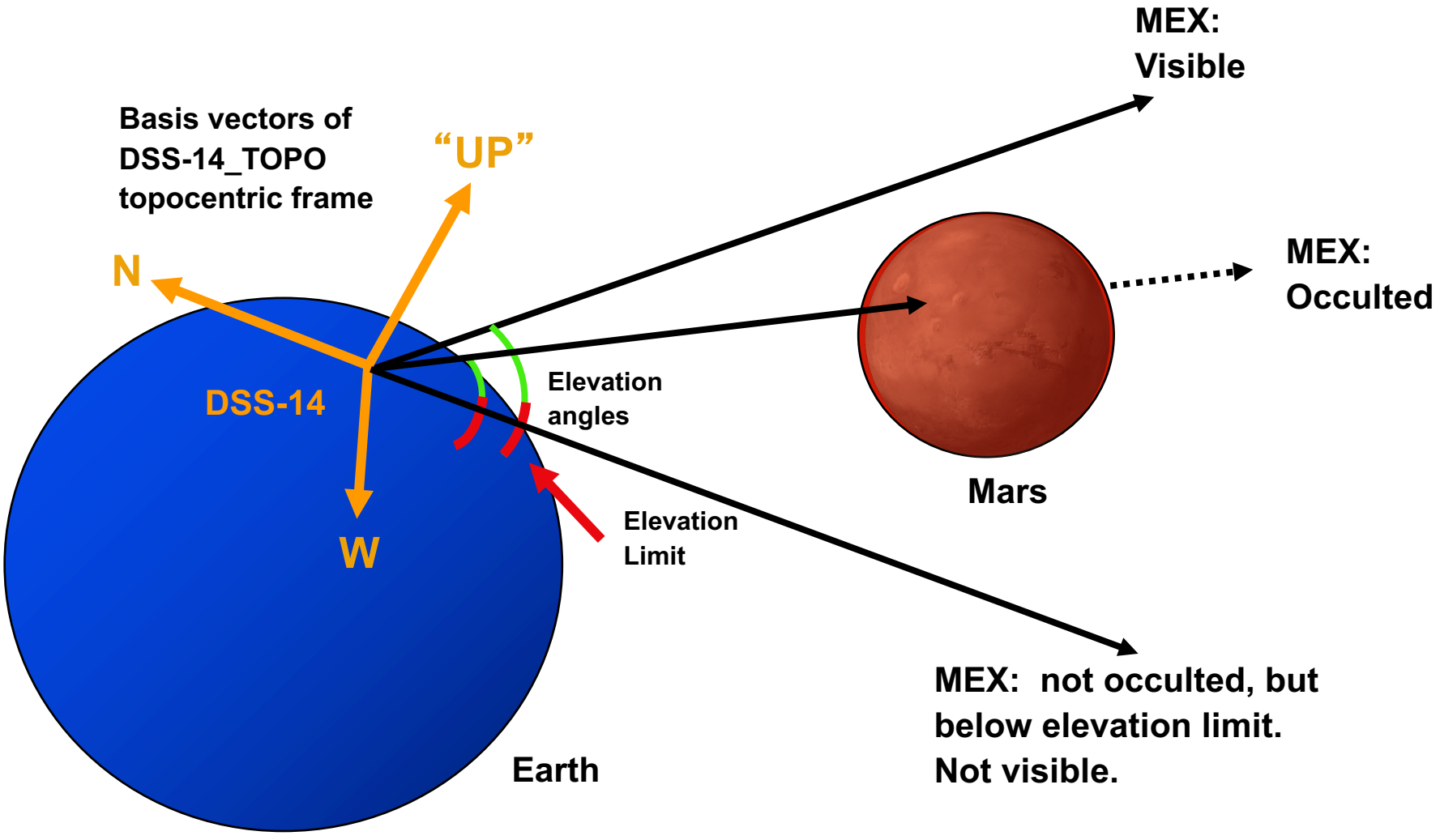
Spacecraft occultation ingress and egress times computed for Mars modeled as a triaxial ellipsoid and as a triangular plate model provided in a DSK differ noticeably due to the Mars topography differing from the ellipsoidal surface for some areas by many kilometers, as illustrated by the animation/view below.



Visibility Geometry

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