



**Fig. 2.** (A) Erythraea Fossa is a graben located on the eastern side of Holden crater (Fig. 1). There are three sub-basins in Erythraea Fossa, here called East (eb), Middle (mb), and West (wb) sub-basins. These sub-basins are separated from each other by what the authors interpret to be slumps or underlying bedrock topography. The contours in (B), (C), and (D) show the highest elevation closed contour inside each of the sub-basins to within 5 m, relative to global mean elevation. Context for Fig. 8 is also given. (B) The highest closed contour in Middle sub-basin is  $-315$  m; (C) East sub-basin,  $-405$  m; (D) West sub-basin,  $-570$  m. This figure is a composite of CTX images P20\_008852\_1550, P19\_008641\_1528, P19\_008496\_1532, P19\_008272\_1545, B01\_010197\_1545, B01\_010131\_1534, B01\_09986\_1534, P13\_005978\_1534, HRSC nadir image h0478\_0000, a THEMIS IR image mosaic. Topographic data is from MOLA global mosaic data.

The three well-developed inlet valleys to East sub-basin (Fig. 4B), and the fact that the drainage area leading into East sub-basin from the east is the largest catchment area connecting to Erythraea Fossa (Fig. 7), imply that water flowed into the Erythraea Fossa OBP system mainly via the inlet valleys at the east end of the fossa. When water reached an elevation slightly above  $-405$  m (Fig. 2D) East sub-basin was breached, spilling into Middle sub-basin. Once water in Middle sub-basin reached a level of slightly above  $-315$  m (Fig. 2C) it also breached, spilling down

the inlet channel to West sub-basin. West sub-basin then filled up, potentially sourced both from the Middle sub-basin and from minor valleys that directly fed it from the south (Fig. 6B). When West sub-basin was filled to an elevation of  $-570$  m, it overtopped and formed the outlet channel to the north (Fig. 5).

As the OBP system dried out, and less water was available, we hypothesize the following scenario. First, the water level in the combined East and Middle sub-basins dropped, separating West sub-basin from East and Middle sub-basins. It seems probable that