Supplemental Material

DEM and Terrain of Zipingpu Reservoir

The digital elevation model and the triangular prism network terrain model we provided here are built in ArcGis. First, we used digital line graphic (DLG) data and Shuttle Radar Topography Mission (STRM) data to derived surface elevation scatters. Then we used these data to create triangular prism network. As we can see, the TIN terrain has different resolutions (or accuracies) in different areas for multi-source data (shown in Figure S1). Finally, we used the Terrain to Raster tool in ArcGIS to convert TIN terrain to DEM (shown in Figure S2). TIN terrain and DEM of the Zipingpu Reservoir are listed below:

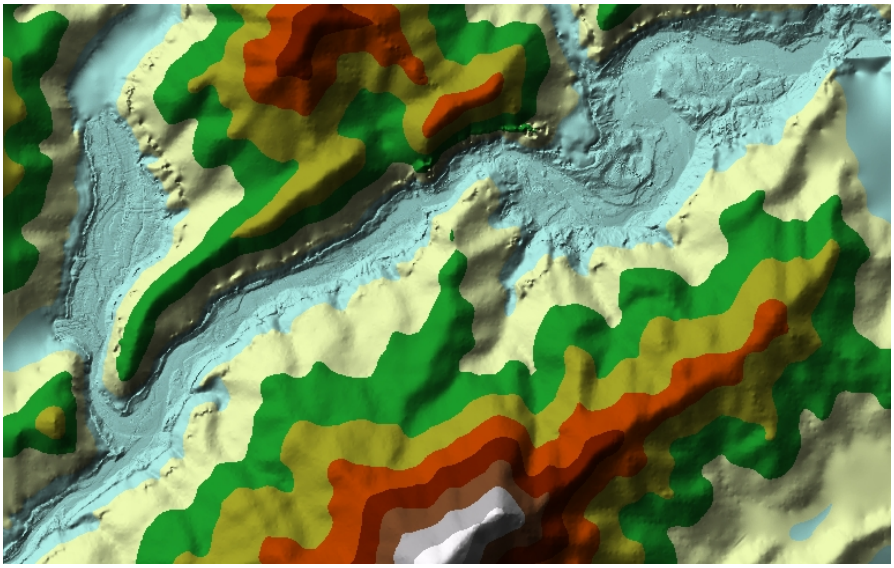
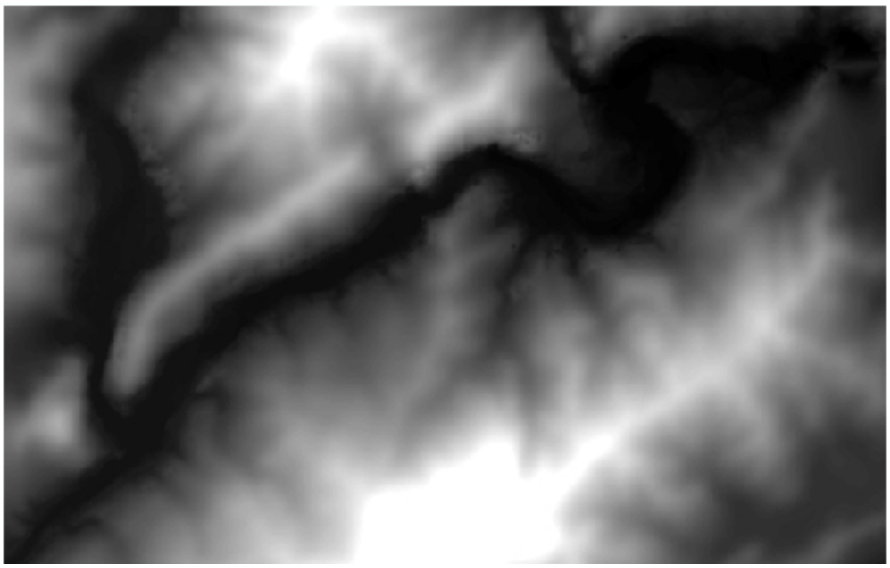
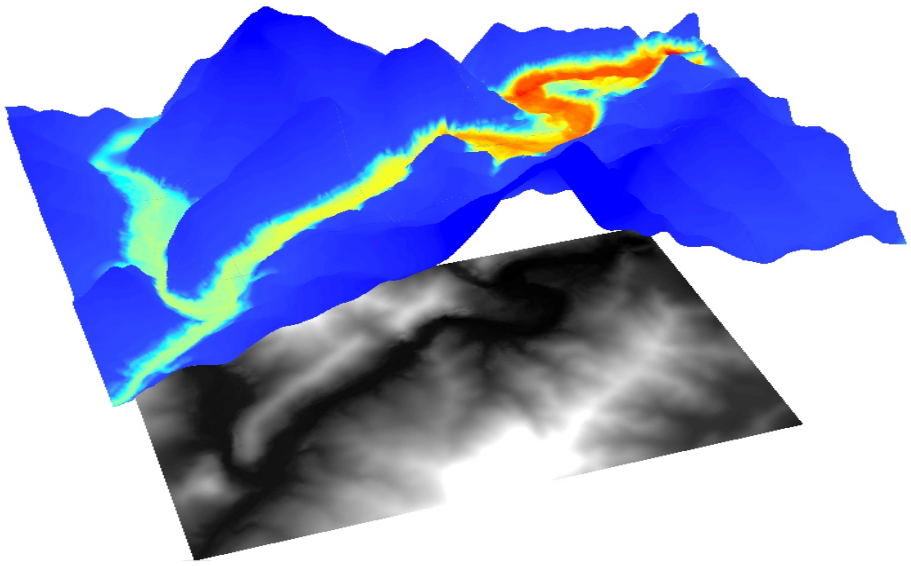


Figure S1. The TIN terrain of Zipingpu Reservoir.



(A)



(B)

Figure S2. The DEM and 3-dimensional visualization of the Zipingpu Reservoir. **(A)** The DEM of the reservoir; **(B)** The 3-dimensional visualization of the reservoir.

Details of Storage Capacity Calculation Methods

The Cross section method (see Figure S3A) can be described as followed:

$$S_{i,j} = \frac{\left(h_j + h_{j+1}\right) d_j}{2} \quad (1)$$

$$V_{i,j} = \frac{L_j \left(S_{i,j} + S_{i+1,j}\right)}{2} \quad (2)$$

$$V_i = \sum_{j=1}^{n} V_{i,j} \quad (3)$$

Here, i denotes the number of cross section, j denotes the number of trapezoid on the cross section i, h_j and h_{j+1} denote the parallel bases of the jth trapezoid, d_j denotes the height of jth trapezoid, $S_{i,j}$ denotes the area of the jth trapezoid, L_i denotes the distance between area $S_{i,j}$ and $S_{i+1,j}$, $V_{i,j}$ denotes the volume of between area $S_{i,j}$ and $S_{i+1,j}$, V_i denotes the storage capacity between the cross section i and i+1.

Triangulate prism method can be described as followed:(see Figure S3B).

$$l = \frac{a+b+c}{2} \quad (4)$$

$$S = \sqrt{(l-a)(l-b)(l-c)l} \quad (5)$$

$$V_i = S\left(\frac{h_A + h_B + h_C}{3}\right) \quad (6)$$

Here，ΔABC denotes terrain base of prism i, $\Delta A'B'C'$ denotes the projected base of terrain base

ΔABC on water level plane, l denotes the length between the triangles, a, b and c respectively denotes the three sides of $\Delta A'B'C'$, S denotes the area of $\Delta A'B'C'$, h_A, h_B and h_C respectively denotes the three heights of prism, V_i denotes the volume of prism i.

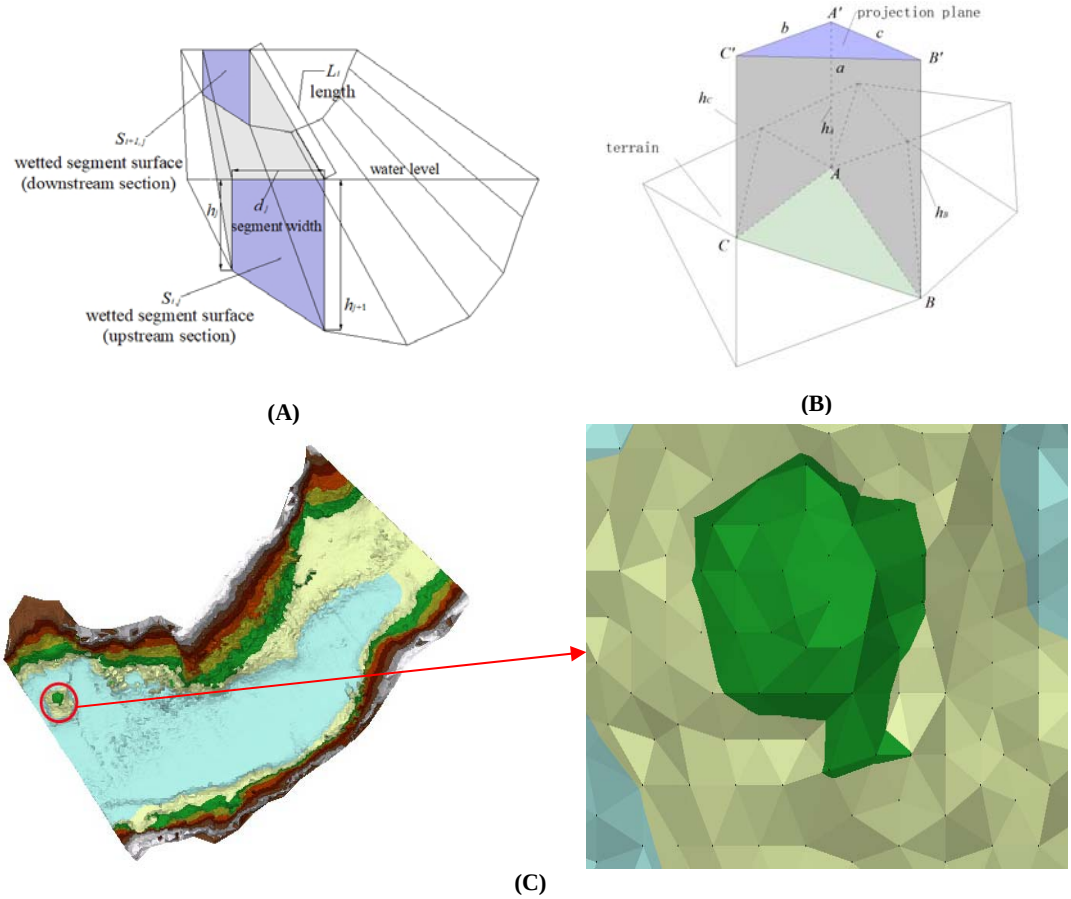
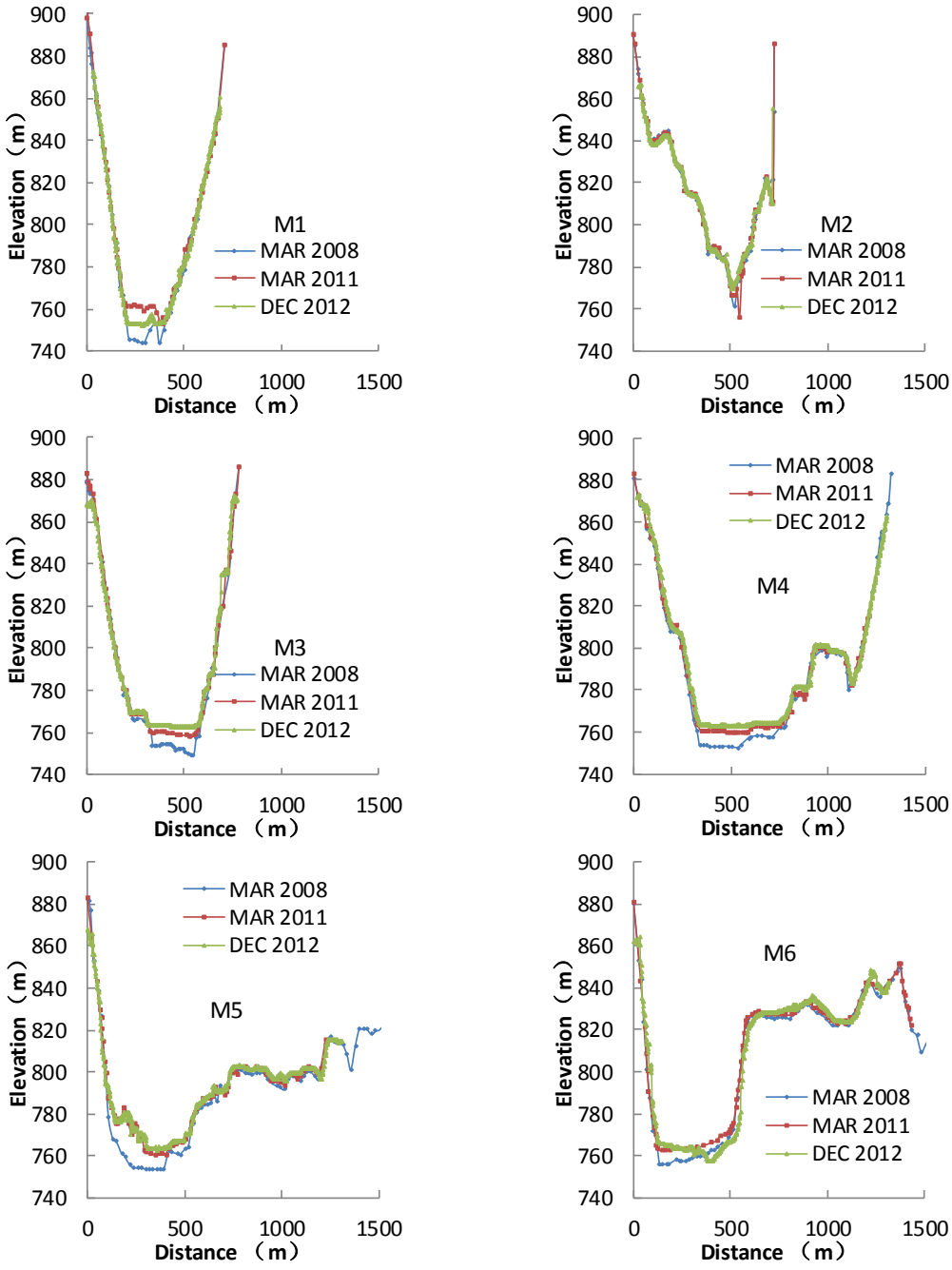
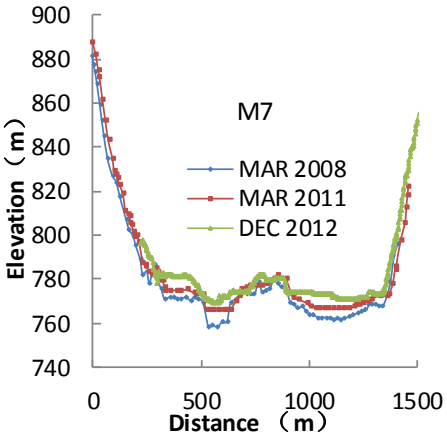


Figure S3. The storage capacity calculation method. **(A)** Cross-section Method; **(B)** Triangle Prism Method; and **(C)** Triangulated Terrain between M13 and M14.

Topographic Profile Data of all Cross-sections

To investigate the changes of cross-sectional, we retrieved the topographical profiles from the MBES survey data. It's obvious that Wenchuan earthquake induces severe sediment deposition in the channel of Zipingpu Reservoir. And the results can be concluded from Figure S2 and Figure S4 below.




M7
MAR 2008
MAR 2011
DEC 2012
Elevation（m）
Distance （m）
900
880
860
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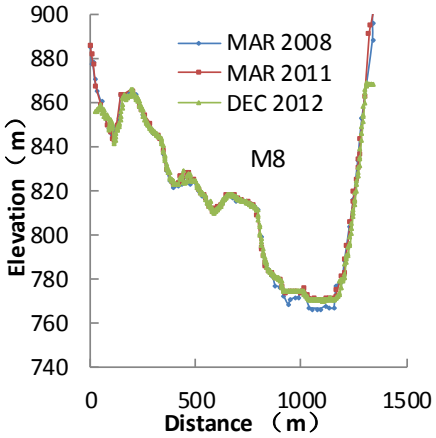
M8
MAR 2008
MAR 2011
DEC 2012
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Distance （m）
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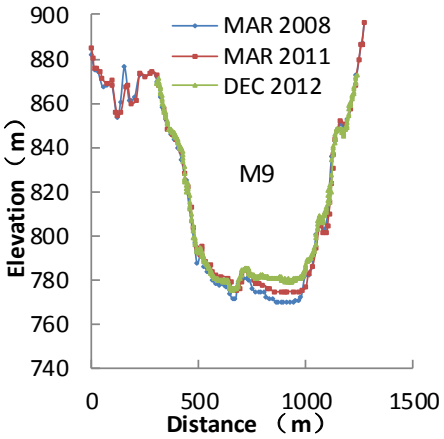
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MAR 2008
MAR 2011
DEC 2012
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Distance （m）
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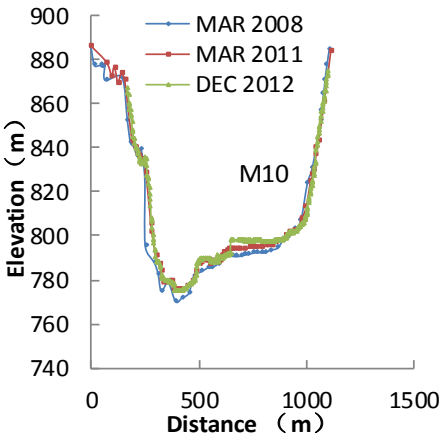
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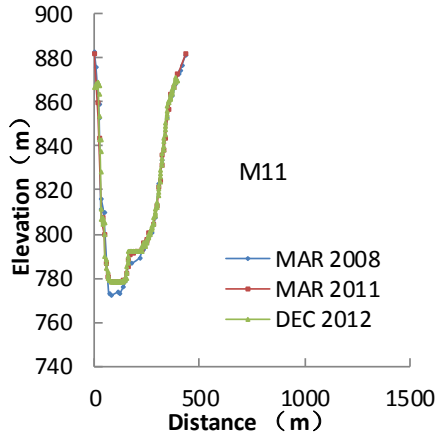
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MAR 2008
MAR 2011
DEC 2012
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Distance （m）
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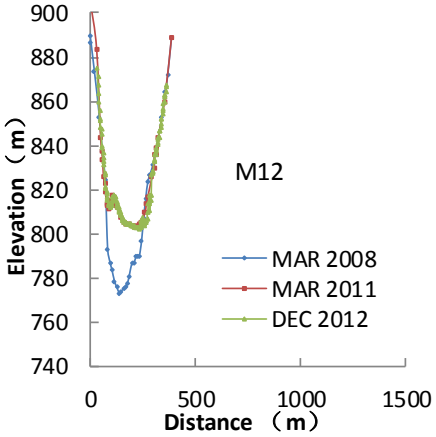
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MAR 2008
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Distance （m）
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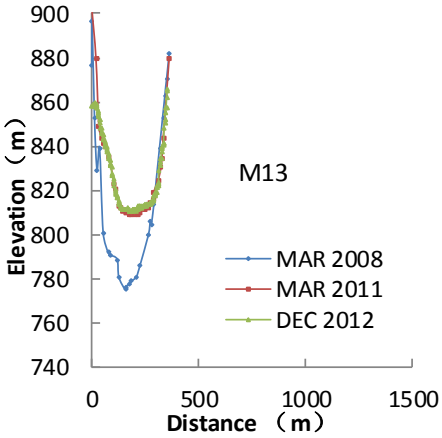
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MAR 2008
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DEC 2012
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Distance （m）
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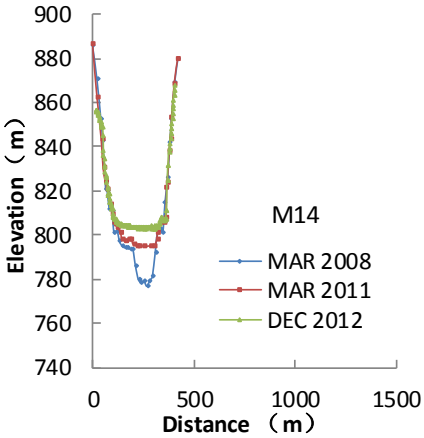
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MAR 2008
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Distance （m）
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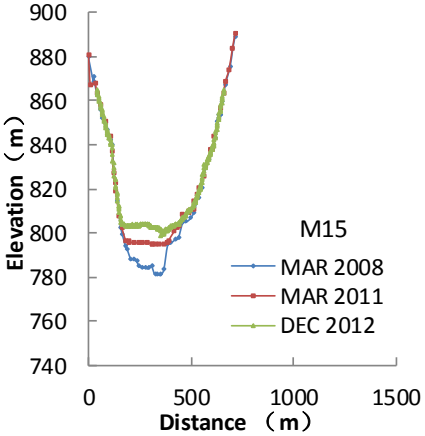
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MAR 2008
MAR 2011
DEC 2012
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Distance （m）
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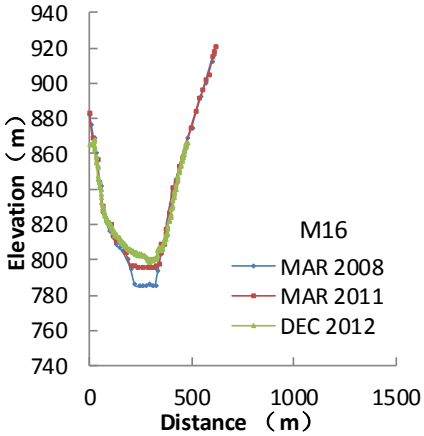
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MAR 2011
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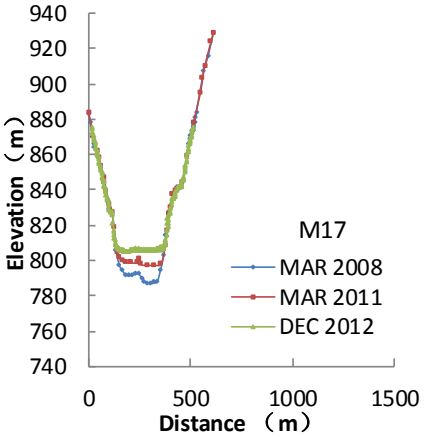
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MAR 2011
DEC 2012
Elevation（m）
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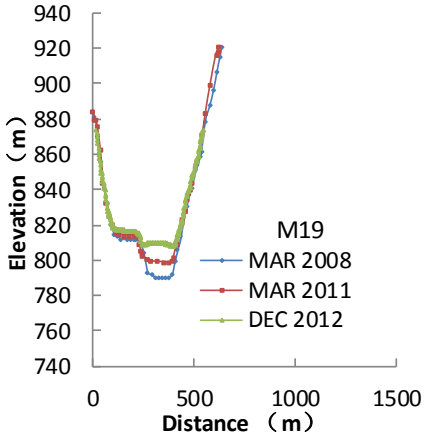
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MAR 2011
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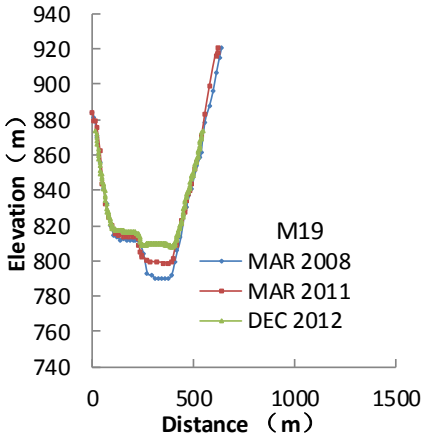
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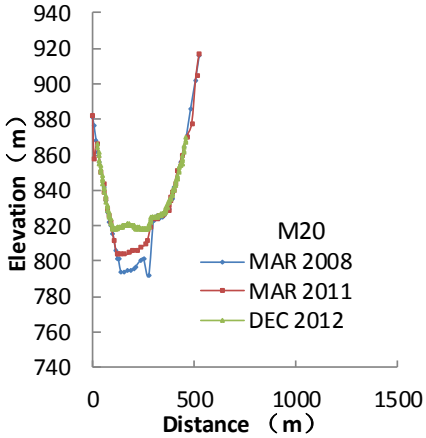
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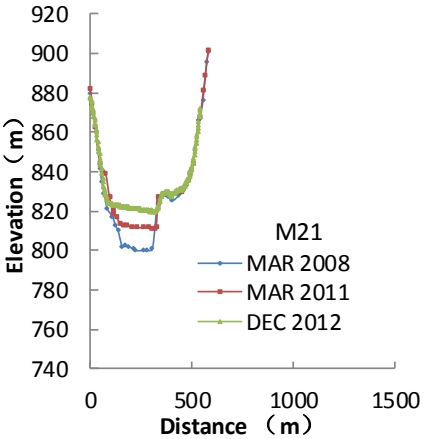
MAR 2011
DEC 2012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Elevation（m）
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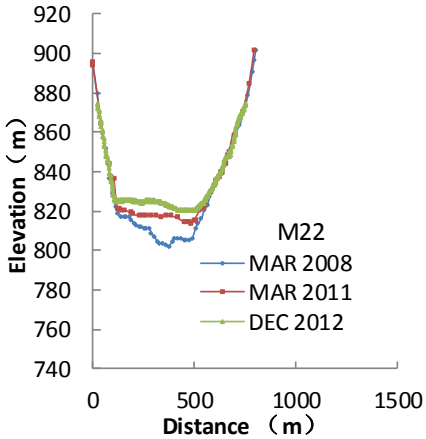
MAR 2008
MAR 2011
DEC 2012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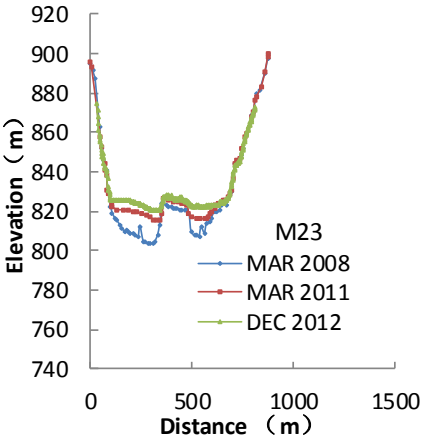
MAR 2008
MAR 2011
DEC 2012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Distance （m）
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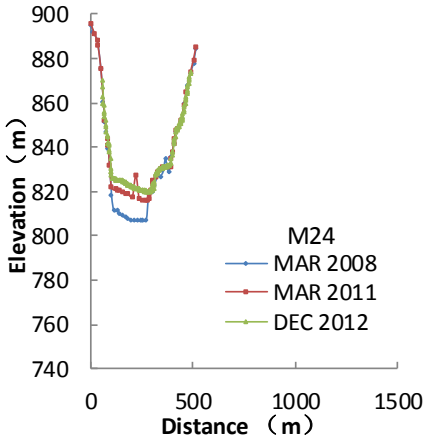
MAR 2011
DEC 2012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Distance （m）
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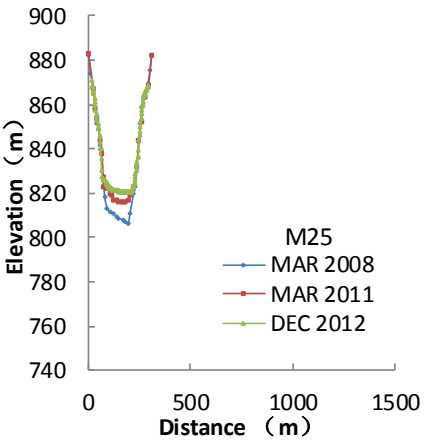
MAR 2008
MAR 2011
DEC 2012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Distance （m）
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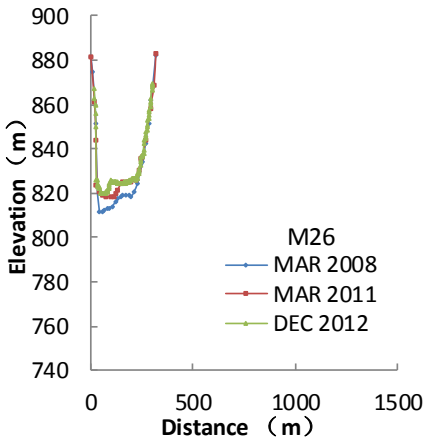
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Distance （m）
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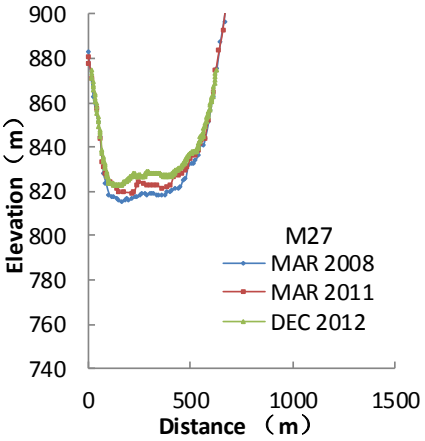
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DEC 2012
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Distance （m）
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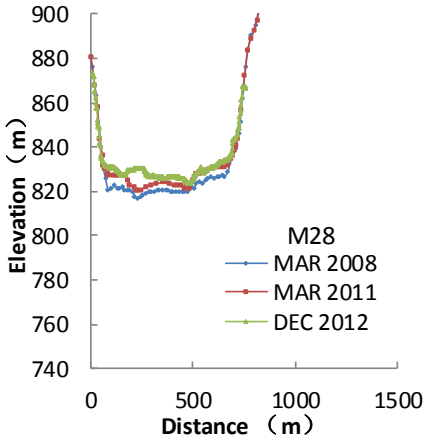
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DEC 2012
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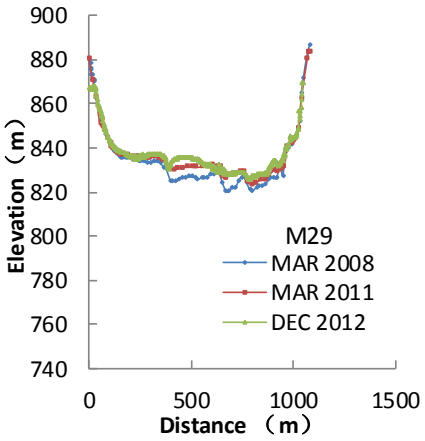
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MAR 2008
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DEC 2012
Elevation（m）
Distance （m）
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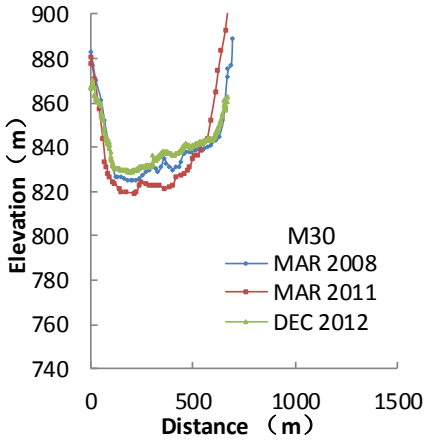
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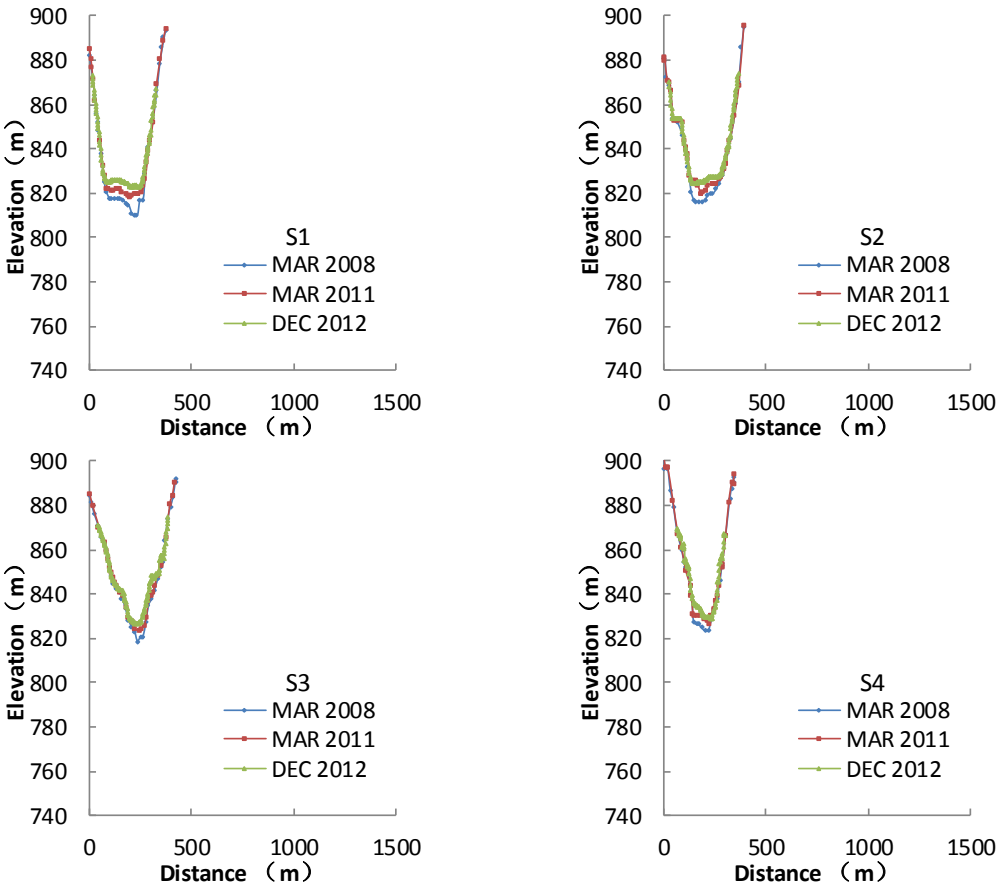

Figure S4. The topographic profiles of all cross sections