remote sensing

MDPI

Supplementary Material

Flow duration curve from satellite: potential of lifetime SWOT mission

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Results

Discharge estimation

This section reports the results on streamflows estimation by means of the adopted methodology (see Section 3). Performances are evaluated in terms of *MAE*, *RMSE*, *rMAE* and *rRMSE*.

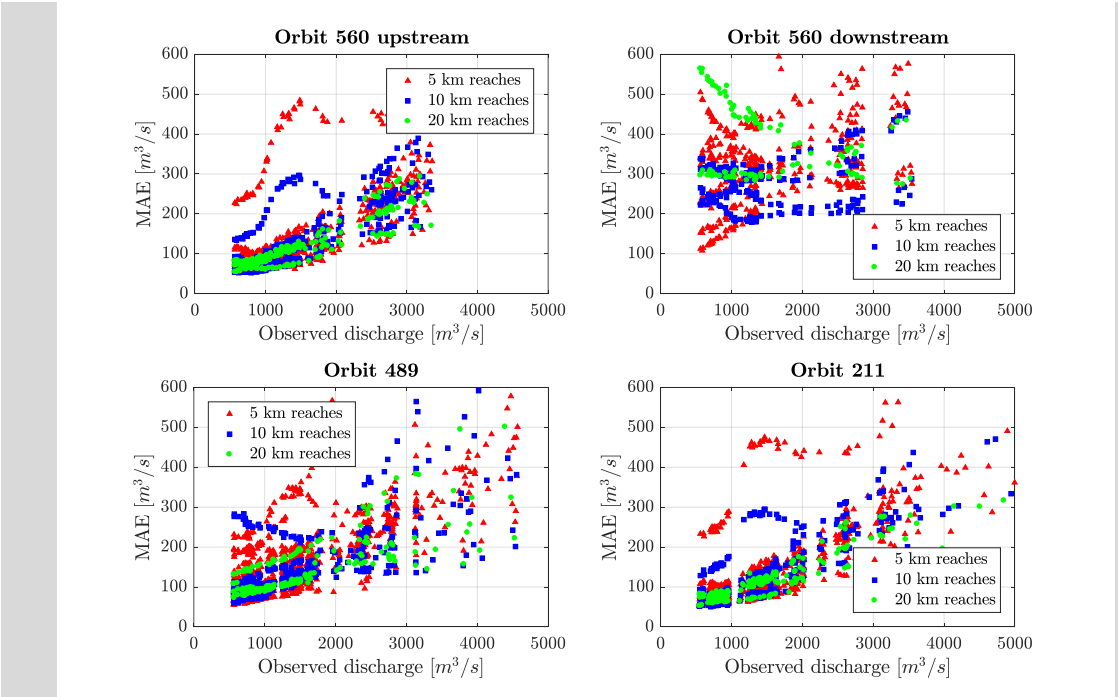


Figure S1: *MAE* for all satellite overpasses and swaths considering different discretization lengths (Δx= 5,10, 20 km): orbit 560, 211 (right swath in Figure 3) and 489 (left swath in Figure 3).

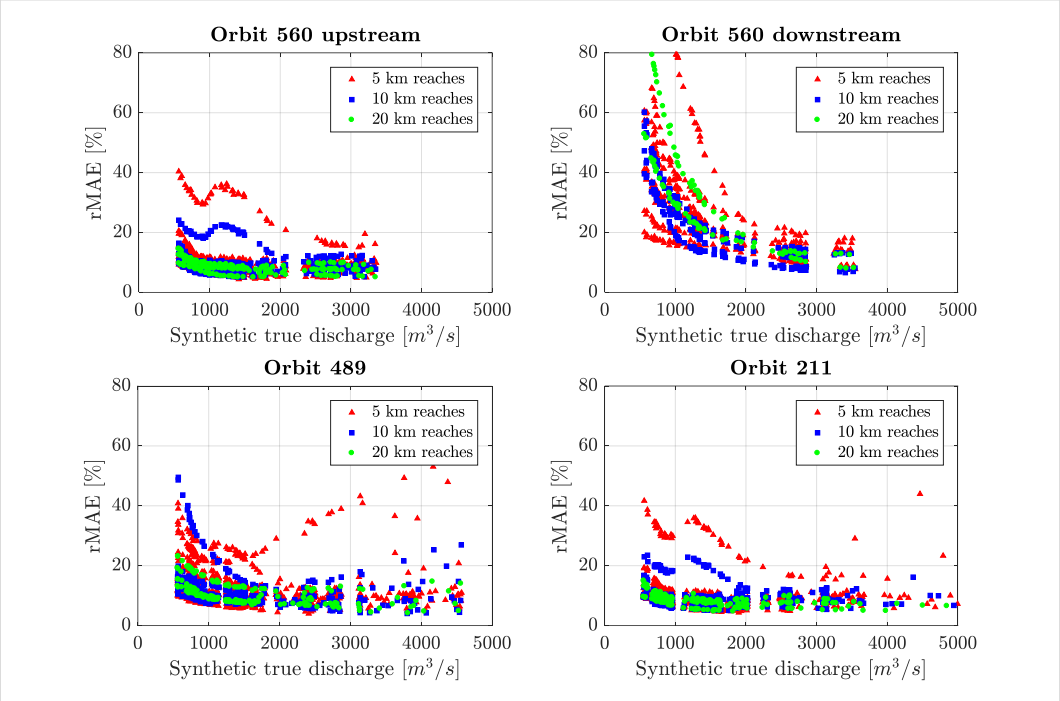


Figure S2: *rMAE* for all satellite overpasses and swaths considering different discretization lengths (Δx= 5,10, 20 km): orbit 560, 211 (right swath in Figure 3) and 489 (left swath in Figure 3).

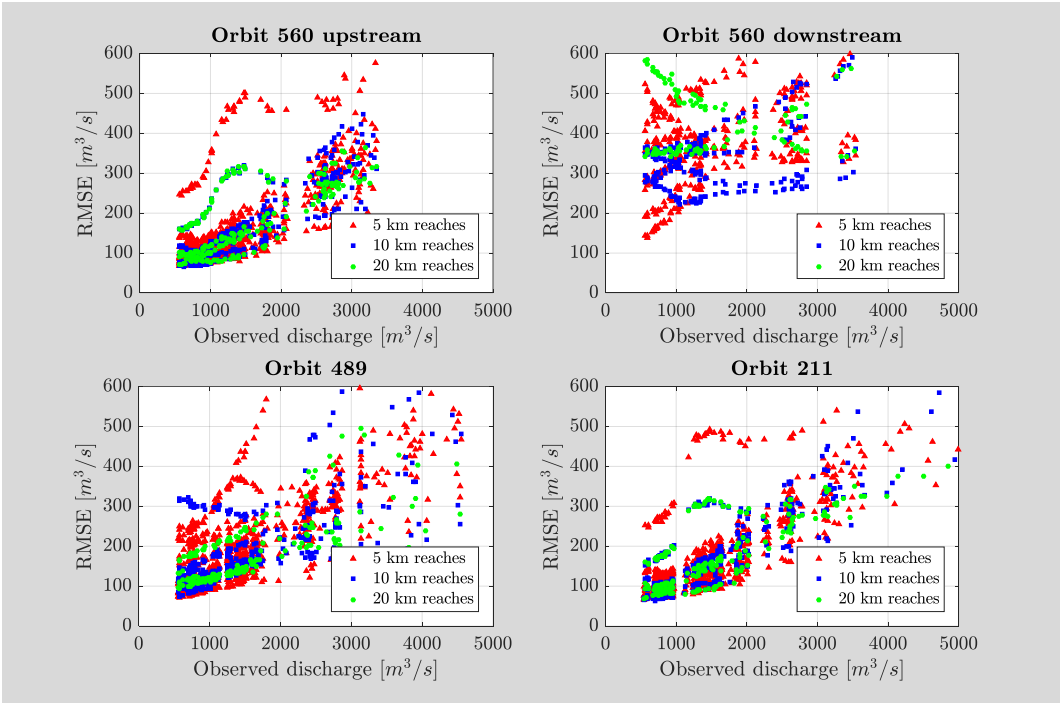


Figure S3: *RMSE* for all satellite overpasses and swaths considering different discretization lengths (Δx= 5,10, 20 km): orbit 560, 211 (right swath in Figure 3) and 489 (left swath in Figure 3).

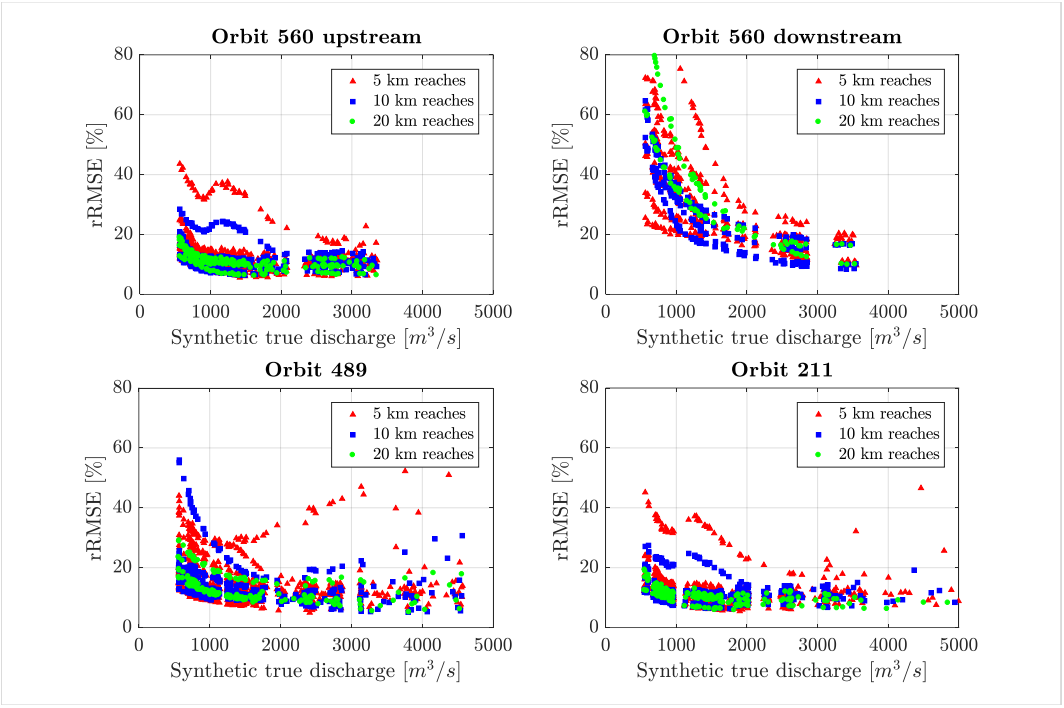
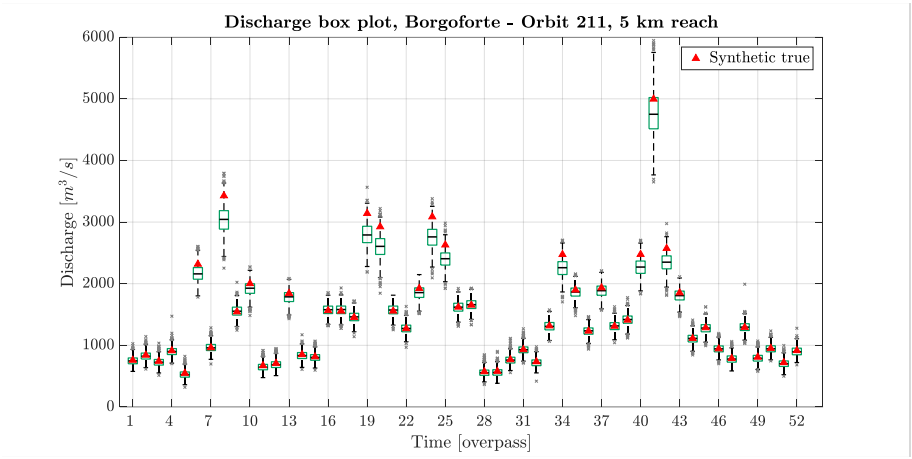
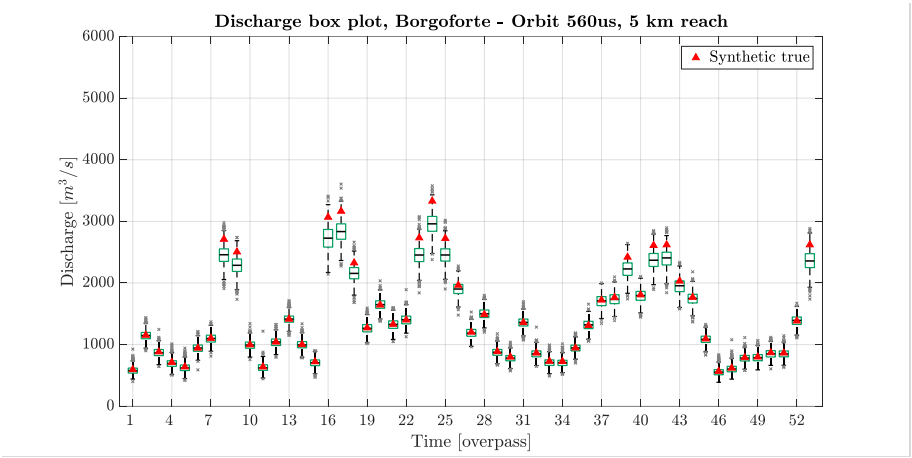


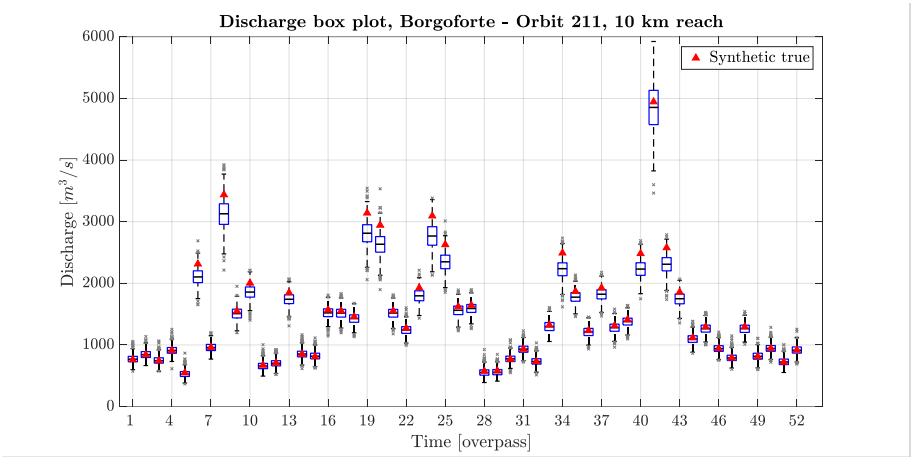
Figure S4: *rRMSE* for all satellite overpasses and swaths considering different discretization lengths (Δx= 5,10, 20 km): orbit 560, 211 (right swath in Figure 3) and 489 (left swath in Figure 3).

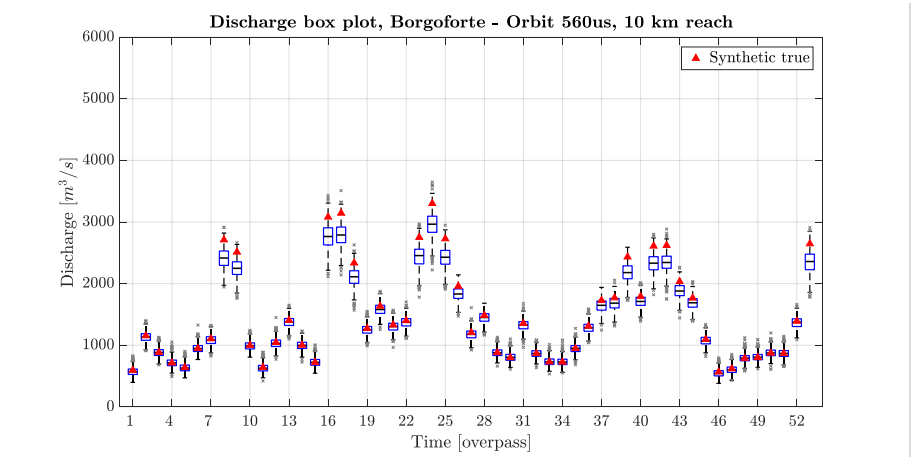
Spatial and temporal monitoring of the study area

This section provides an overview of the spatial and temporal monitoring expected from SWOT as well as of the performance of the approach in estimating the discharge. In particular, Figure S5-S8 show the boxplots of the N estimated discharges ($\hat{Q}_{ij}$; eq. 5) along with the observed values ($\hat{Q}_{ij,sim}$; eq. 7; red triangular) at all the gauging stations and considering all river discretizations adopted in the study. Results are organized considering each gauging station at time, moving downstream along the river. Different box-plot colors indicate different Δx: green, blue and orange for Δx equal to 5, 10 and 20 km, respectively.


Discharge box plot, Borgoforte - Orbit 211, 5 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Borgoforte - Orbit 560us, 5 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Borgoforte - Orbit 211, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Borgoforte - Orbit 560us, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]

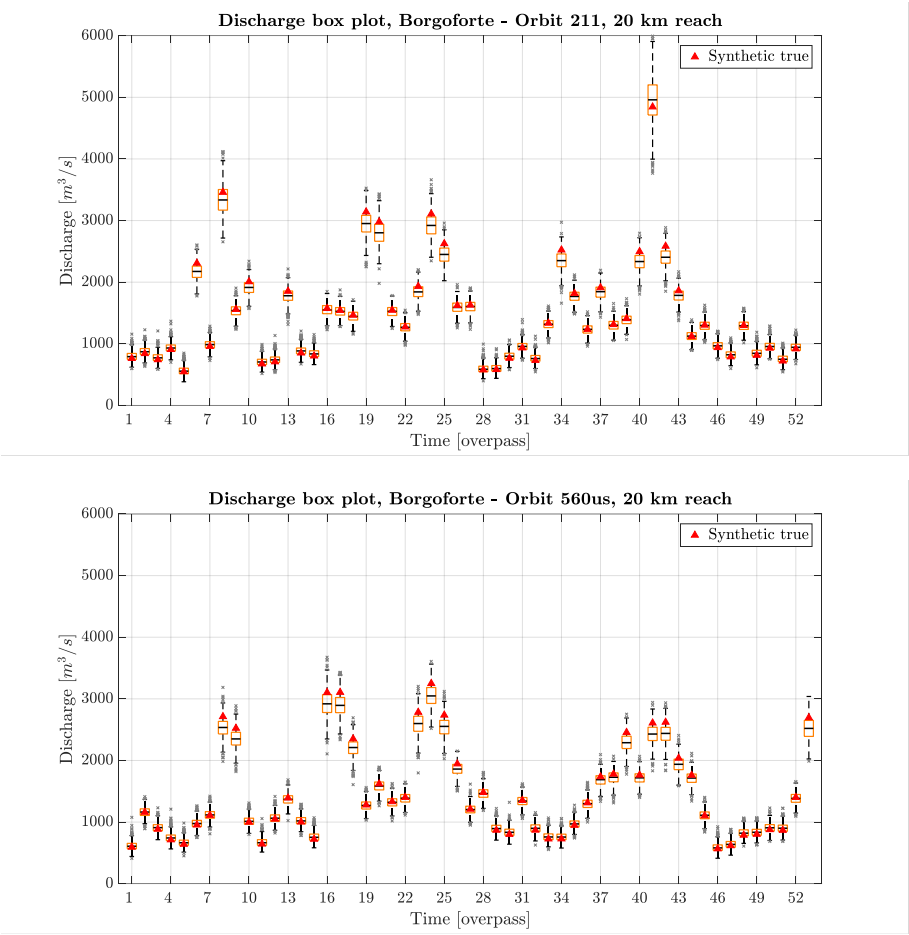
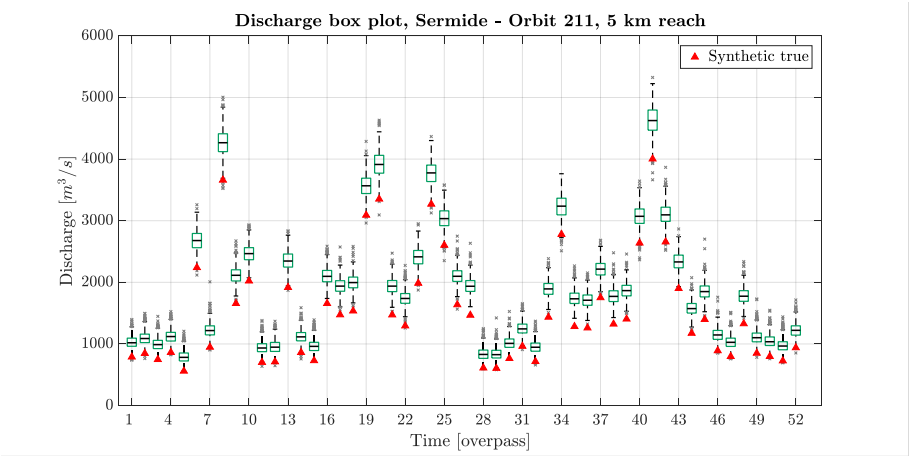
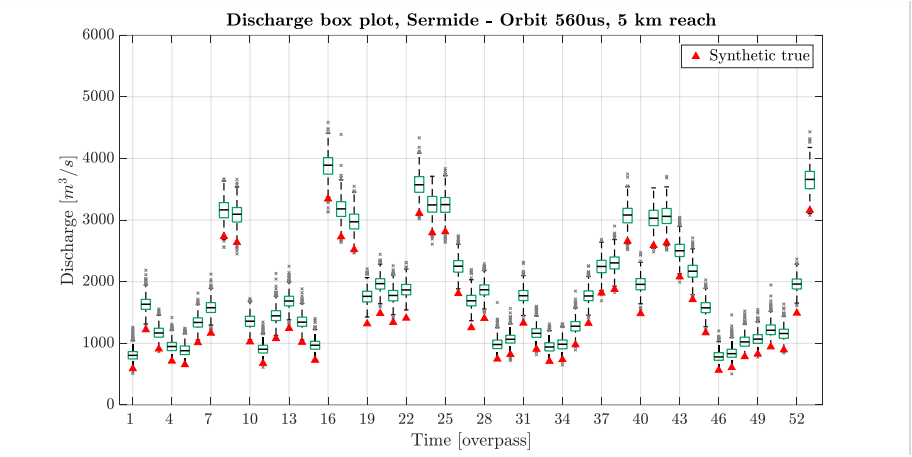
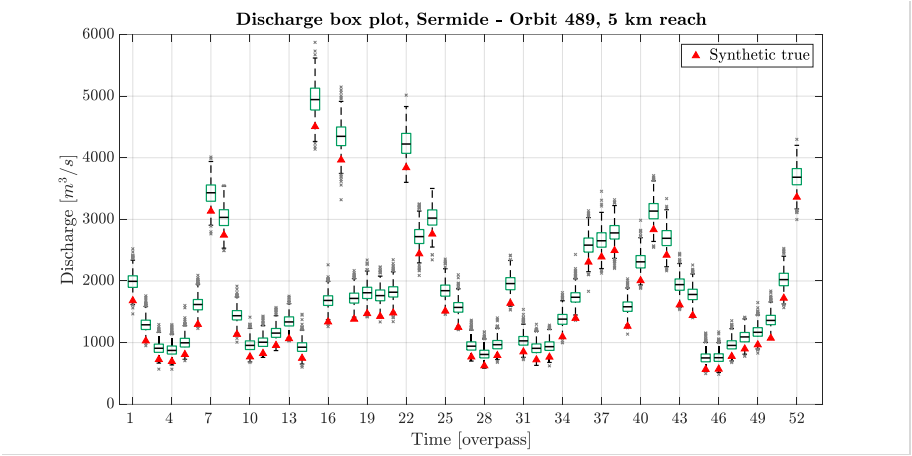
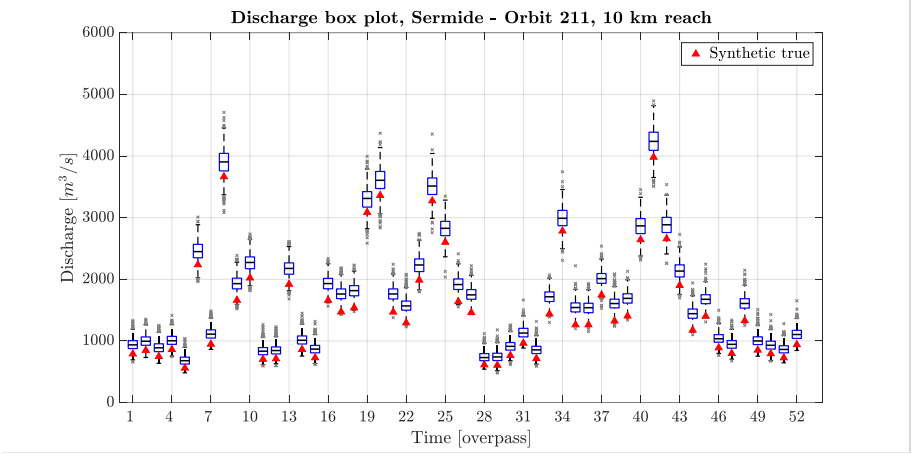


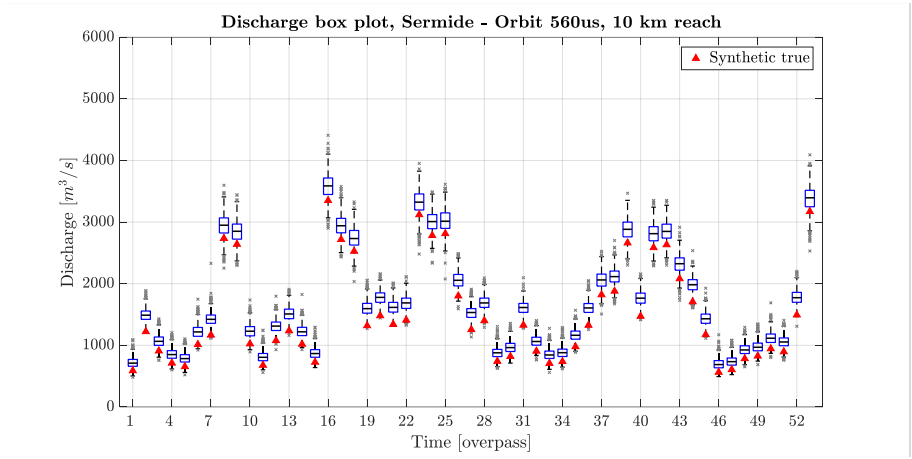
Figure S5. Boxplots of SWOT-based compared with ones provided by the model (synthetic true; red triangle) at the gauging stations of Borgoforte considering all sensing orbits (211 and 560) and river discretizations.

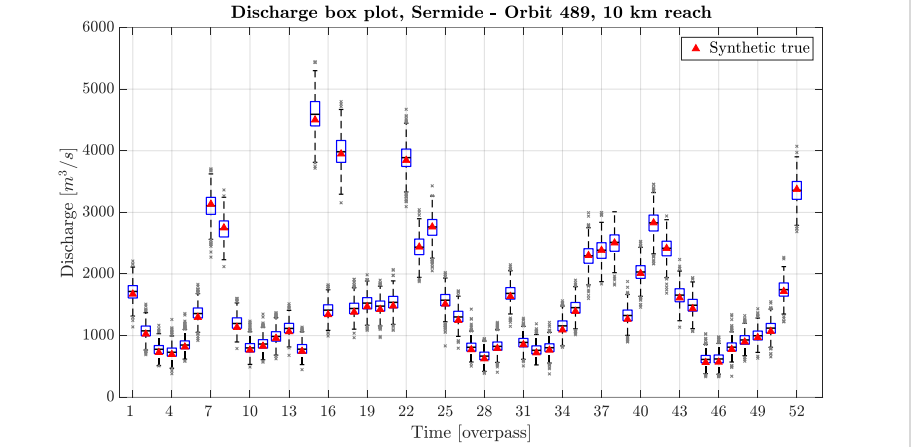


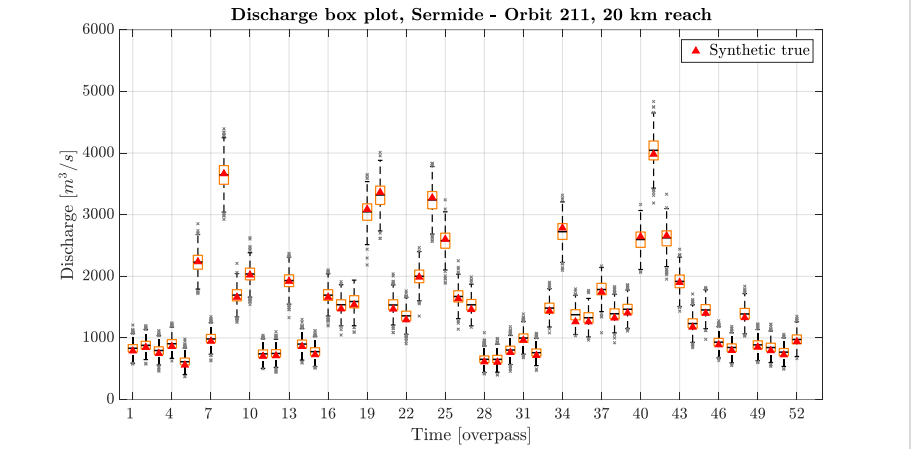

Discharge box plot, Sermide - Orbit 560us, 5 km reach
Synthetic true
Discharge $[m^3/s]$
Time [overpass]

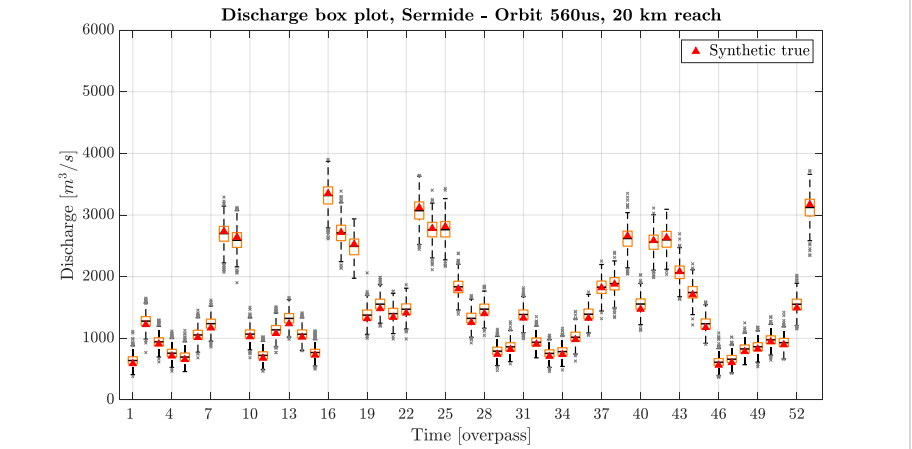

Discharge box plot, Sermide - Orbit 489, 5 km reach
Synthetic true
Discharge $[m^3/s]$
Time [overpass]


Discharge box plot, Sermide - Orbit 211, 10 km reach
Synthetic true
Discharge $[m^3/s]$
Time [overpass]


Discharge box plot, Sermide - Orbit 560us, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Sermide - Orbit 489, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Sermide - Orbit 211, 20 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Sermide - Orbit 560us, 20 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]

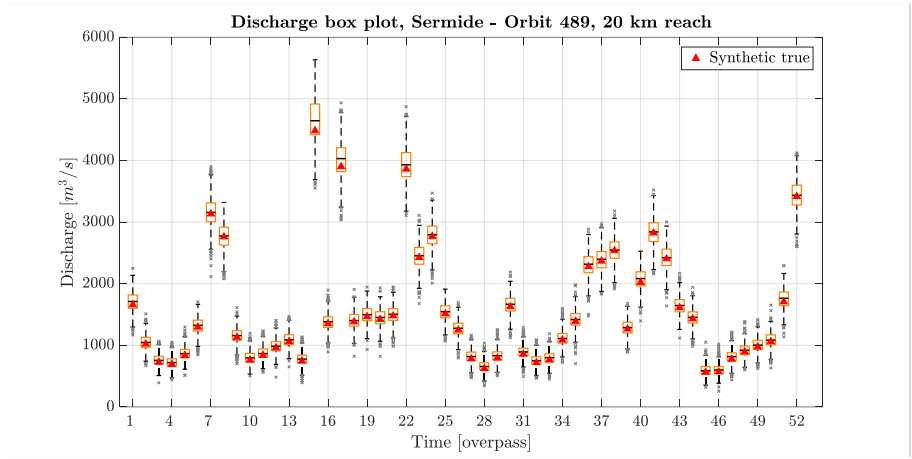
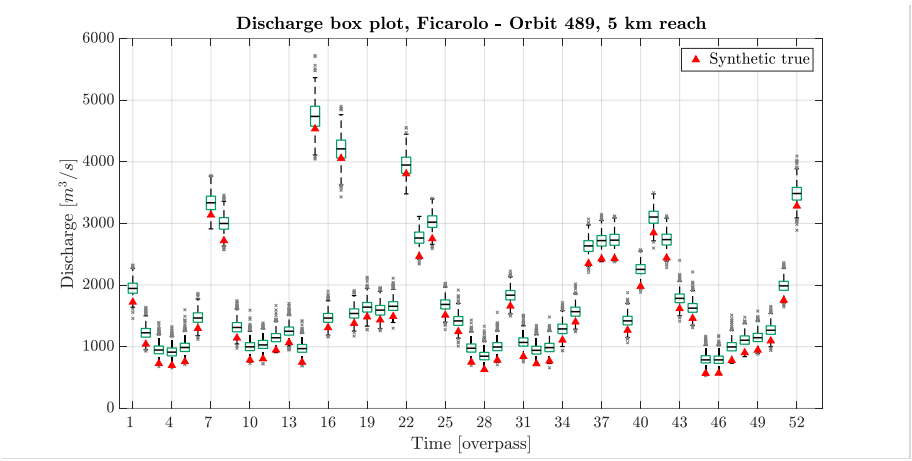
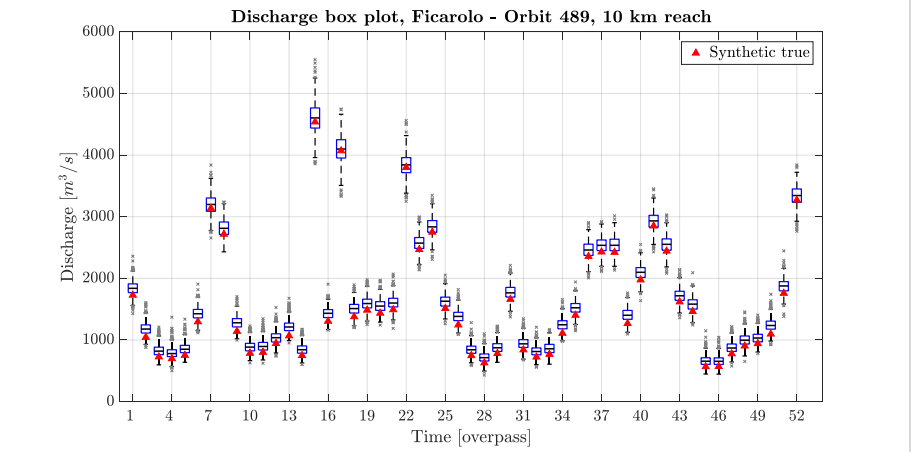


Figure S6. Boxplots of SWOT-based discharges compared with ones provided by the model (synthetic true; red triangle) at the gauging stations of Sermide considering all sensing orbits (211, 560 and 489) and river discretizations.





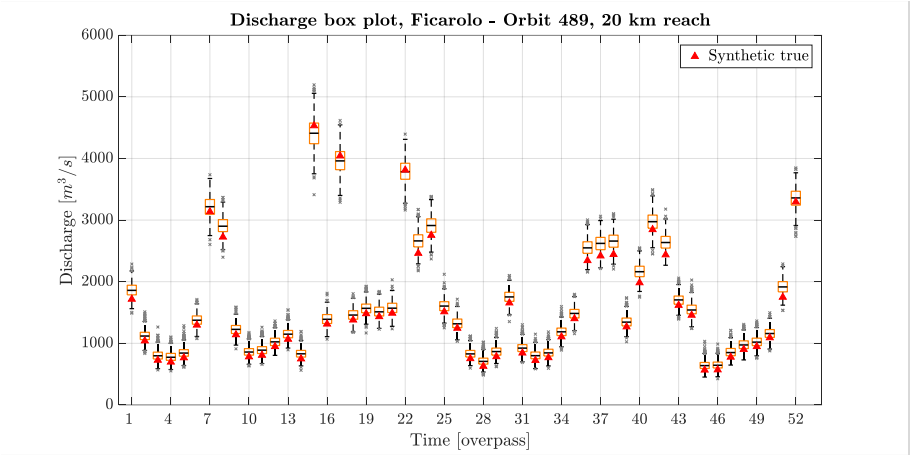
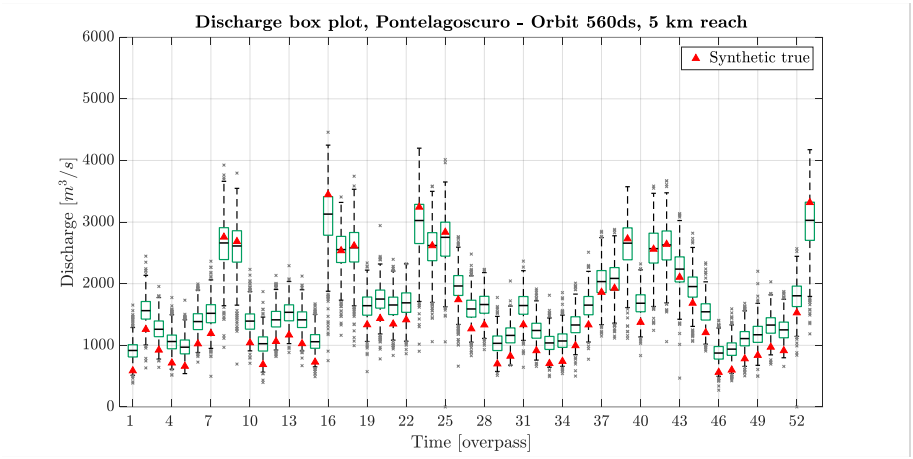
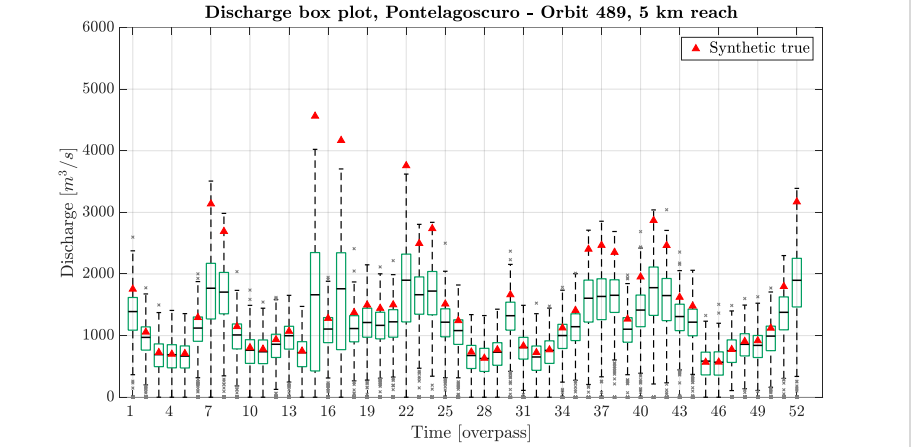
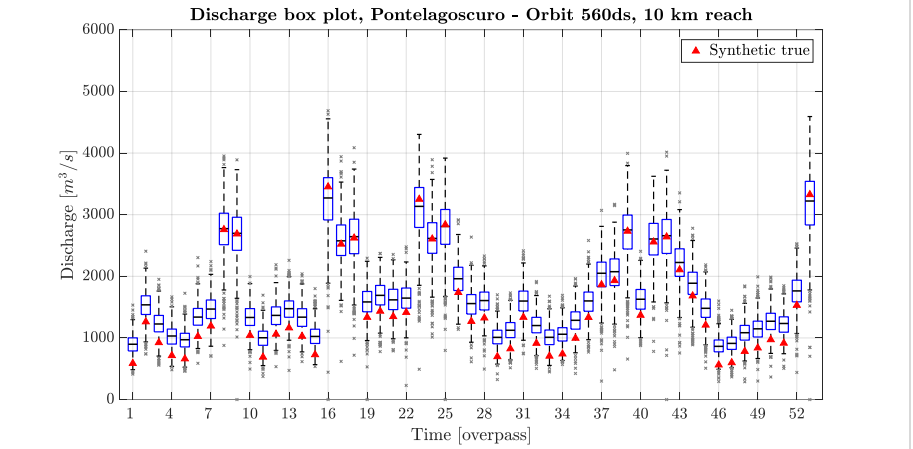
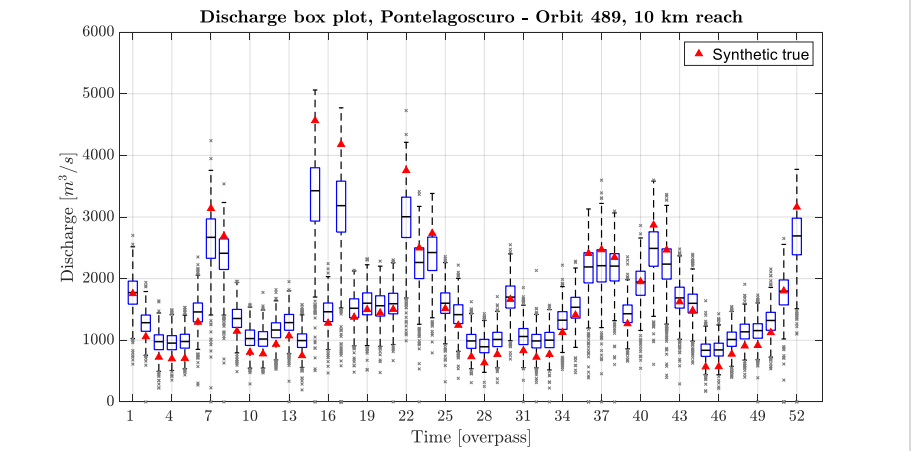


Figure S7. Boxplots of SWOT-based discharges compared with ones provided by the model (synthetic true; red triangle) at the gauging stations of Ficarolo considering orbit 489 and all river discretizations.


Discharge box plot, Pontelagoscuro - Orbit 560ds, 5 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Pontelagoscuro - Orbit 489, 5 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Pontelagoscuro - Orbit 560ds, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]


Discharge box plot, Pontelagoscuro - Orbit 489, 10 km reach
Synthetic true
Discharge [m^3/s]
Time [overpass]

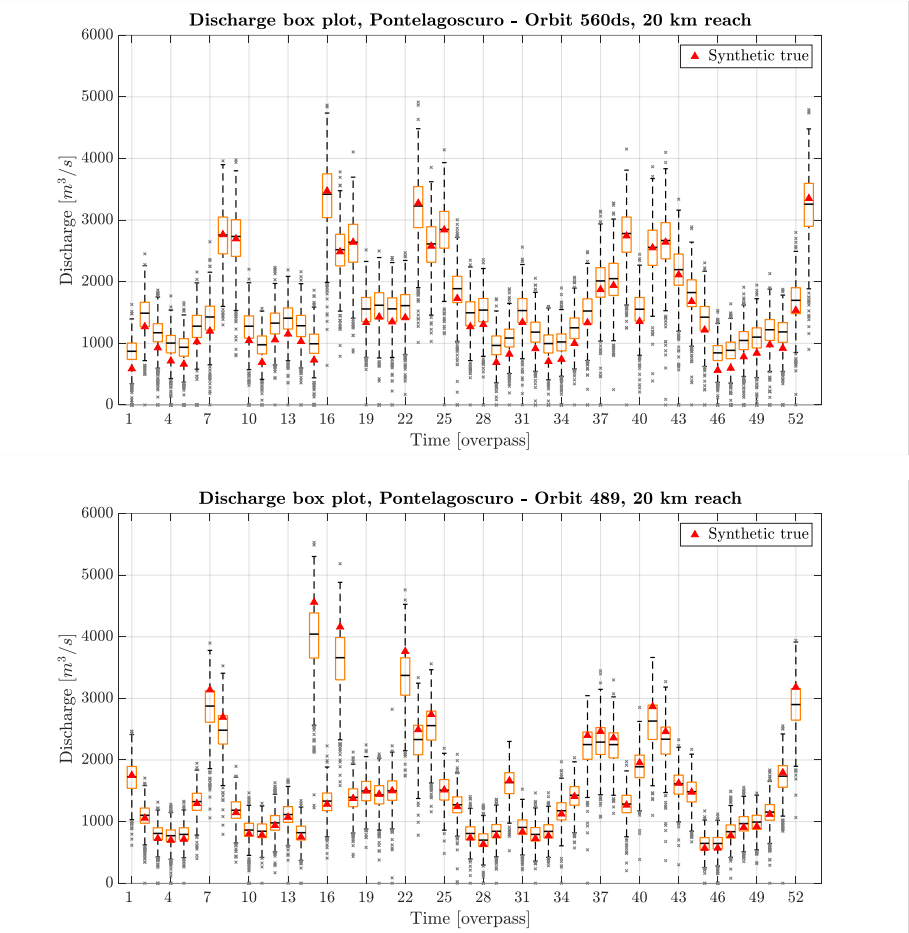


Figure S8. Boxplots of SWOT-based discharges compared with ones provided by the model (synthetic true; red triangle) at the gauging stations of Pontelagoscuro considering all sensing orbits (560 and 489) and river discretizations.