Supporting Information for

On the performance of position-domain sidereal filter for 30-sec kinematic GPS to mitigate multipath errors

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Figures S9 – S15 and Table S1
Figure S9. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each preceding block. Lowpass filtering (LPF) with a cut-off period of 500 seconds is applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process. The same plot but with sidereal filter made of the succeeding block is provided in Figure 5.
Figure S10. An example of east and up components of coordinates before and after sidereal filtering. (a) East coordinates of baseline POTM-POTS before (A) and after sidereal filtering using sidereal filter without (C) and with lowpass filtering using a cut-off period of 500 (D), 5000 (E), and 20000 (F) seconds. Sidereal filters used are drawn with the corresponding color for each lowpass filter setting (B). (b) Same as (a) but for GODE-GODN. (c) Same as (a) but for TSK2-TSKB. (d-f) Same as (a-c) but for up components.
Figure S11. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each succeeding block. Lowpass filtering (LPF) is not applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process.
Figure S12. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each succeeding block. Lowpass filtering (LPF) with a cut-off period of 5000 seconds is applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process. The same plot but with sidereal filter made of the preceding block is provided in Figure S13.
Figure S13. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each preceding block. Lowpass filtering (LPF) with a cut-off period of 5000 seconds is applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process. The same plot but with sidereal filter made of the succeeding block is provided in Figure S12.
Figure S14. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each succeeding block. Lowpass filtering (LPF) with a cut-off period of 20000 seconds is applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process. The same plot but with sidereal filter made of the preceding block is provided in Figure S15.
Figure S15. Coordinate fluctuation (color) of baselines POTM-POTS (a-c), GODE-GODN (d-f), and TSK2-TSKB (g-i) in each block after sidereal filtering (SRF). The sidereal filter is made of each preceding block. Lowpass filtering (LPF) with a cut-off period of 20000 seconds is applied to coordinates used as sidereal filter. Left (a, d, and g), center (b, e, and h), and right (c, f, and i) columns indicate north, east, and up components, respectively. Green color represents epochs filled by interpolation of neighboring epochs during the data cleaning process. The same plot but with sidereal filter made of the succeeding block is provided in Figure S14.
Table S1. Setting of 1-Hz GPS kinematic analysis for GODE-GODN

| Block #  | DOY | Start time   | End time   | Duration [s] | Block # of pair | Corresponding block # of 30-sec data analysis |
|----------|-----|--------------|------------|--------------|-----------------|---------------------------------------------|
| 1        | 1   | 01:00:00     | 06:59:59   | 21600        | 4               | 1                                           |
| 2        | 2   | 00:55:54     | 06:55:53   | 21600        | 5               | 1                                           |
| 3        | 3   | 00:51:48     | 06:51:47   | 21600        | 6               | 1                                           |
| 4        | 6   | 00:39:30     | 06:39:29   | 21600        | 1               | 2                                           |
| 5        | 7   | 00:35:24     | 06:35:23   | 21600        | 2               | 2                                           |
| 6        | 8   | 00:31:18     | 06:31:17   | 21600        | 3               | 2                                           |

*Independent from the block # for 30-sec data analysis*