

# Contents

**Part I    Satellite Navigation Signal System, Compatibility  
          and Interoperability**

**1    Optimization Selection of the HRC Correlator Spacing  
      for Different Navigation Signals. . . . .    3**  
      Song Li, Jing Lv, Jiang Chang, Xiang Tian and Kaixiang Tong

**2    The Key Questions Discussing of the Inter-Satellite Link  
      (ISL) Signal Design Based on Earth-Moon System . . . . .    15**  
      Jianjun Fan, Yang Yang and Min Li

**3    Application Study of a Phase-Optimized Constant-Envelope  
      Transmission (POCET) Optimization Algorithm  
      for BDS B1 Signal . . . . .    27**  
      Minggui Cai, Jun Xie and Gang Wang

**4    Nonlinear Equalization with Symbol Error Aided in Beidou  
      Satellite Navigation Communication System. . . . .    37**  
      Chengkai Tang, Baowang Lian and Yi Zhang

**5    GCE-BOC Modulation: A Generalized Multiplexing Technology  
      for Modern GNSS Dual-Frequency Signals . . . . .    47**  
      Xinming Huang, Xiangwei Zhu, Xiaomei Tang, Hang Gong  
      and Gang Ou

**6    Research of Novel BCC Signal Structure . . . . .    57**  
      Ying Xu, Zhili He, Maoshu Zeng, Hong Yuan and Weina Hao

**Part II    Satellite Navigation Augmentation and Integrity Monitoring**

|  |            |
|--|------------|
| <b>7    Research on Multi Satellite Failure Detection and Recognition<br/>Method of Satellite Navigation RAIM . . . . .</b>      | <b>77</b>  |
| Zhixin Deng, Jun Li and Mengjiang Liu  |            |
| <b>8    Ionospheric Threat Model Methodology for China Area. . . . .</b>   | <b>91</b>  |
| Dun Liu, Li Chen, Liang Chen and Weimin Zhen   |            |
| <b>9    Real-Time Cycle Slip Detection and Repair Algorithm<br/>for SBAS Airborne Receiver . . . . .</b>                         | <b>101</b> |
| Jie Chen, Zhigang Huang and Rui Li   |            |
| <b>10   Study on Space-Based All Source Navigation Technology . . . . .</b>  | <b>113</b> |
| Ying Wang, Yansong Meng, Zhe Su and Xiaoxia Tao  |            |
| <b>11   Carrier-Phase RAIM Algorithm Based on a Vector<br/>Autoregressive Model . . . . .</b>                                    | <b>125</b> |
| Qianqian Zhang and Qingming Gui  |            |
| <b>12   A Beidou Based Multiple-GNSS Positioning Algorithm<br/>for Mission Critical Applications . . . . .</b>                   | <b>143</b> |
| Shaojun Feng, Shenghai Wang, Jianye Liu, Qinghua Zeng<br>and Washington Ochieng  |            |
| <b>13   A Novel RAIM Algorithm for Single-Frequency GNSS<br/>Receiver Based on Virtual Triple-Frequency Techniques . . . . .</b> | <b>157</b> |
| Leijin Han, Hu Lu, Yan Xie and Chen Chen   |            |
| <b>14   Evaluation Method Research on GNSS Signal-in-Space<br/>Continuity . . . . .</b>  | <b>173</b> |
| Yang Tang and Rui Li   |            |
| <b>15   A New Method of Ionospheric Grid Correction Based<br/>on Improved Kriging . . . . .</b>                                  | <b>183</b> |
| Qidong Zhang and Rui Li  |            |
| <b>16   A RAIM Method of Pseudo-range Residual Based<br/>on Positioning Result of Proportion of Visible Satellites . . . . .</b> | <b>195</b> |
| Jie Wu, Ao Peng and Jianghong Shi  |            |

|   |            |
|---|------------|
| <b>17 Zenith Tropospheric Delay Modeling Method for Sparse Reference Station Network Considering Height Difference . . . . .</b>    | <b>209</b> |
| Yang Yang, Guorong Yu, Shuguo Pan, Wang Gao and Weirong Chen  |            |
| <b>18 Performance Monitoring of BeiDou Navigation Satellite System Ionospheric Grid. . . . .</b>                                    | <b>221</b> |
| Hui Zhang, Daliang Gong, Mo Wu, He Zhao and Long Bai  |            |
| <b>19 Analysis and Improvement to Ionosphere Grads Integrity Monitoring Algorithm in Ground Based Augmentation System . . . . .</b> | <b>237</b> |
| Zhaodong Xing, Jingbo Zhao, Zhenhua Wang and Chunyang Zhi   |            |
| <b>20 Calibration Method of the IGSO Satellites Ascending Node Longitude . . . . .</b>  | <b>249</b> |
| Quan-jun Li, Da-li Wang, Yong Yuan and Ni Kang  |            |
| <b>21 Ionosphere Integrity Monitoring Based on the Combined System of GPS and BDS . . . . .</b>                                     | <b>259</b> |
| Chuanhua Zhao, Jinzhong Bei, Shan Pan and Hongying Zhang  |            |
| <b>22 Localizability Analysis of Cooperative Positioning with Range Measurement . . . . .</b>                                       | <b>269</b> |
| Yaning Liu, Guangxia Li, Jing Lv, Jiang Chang and Shiwei Tian   |            |
| <b>23 Code-Carrier Divergence Monitoring for BeiDou Ground-Based Augmentation System. . . . .</b>                                   | <b>281</b> |
| Lin Zhao, Weixin Yang, Liang Li and Fuxin Yang  |            |
| <b>24 Threshold Determination for Integrity Monitoring in Local Area Augmentation System . . . . .</b>                              | <b>293</b> |
| Shuai Xiong   |            |
| <b>25 Multi-constellation Receiver Autonomous Integrity Monitoring with BDS/GPS/Galileo. . . . .</b>                                | <b>301</b> |
| Yuan Sun, Yanbo Zhu and Rui Xue   |            |
| <b>26 The Service Performance Evaluation of Different Satellite Based Augmentation Systems . . . . .</b>                            | <b>311</b> |
| Yuechen Wang, Biao Jin and Shanshan Chen  |            |

|           |  |            |
|-----------|--|------------|
| <b>27</b> | <b>An Analysis of the QZSS Signal Based on the Data of IGS . . . . .</b>                                     | <b>325</b> |
|           | Xin Nie, Fu Zheng, Yidong Lou, Jinjun Zheng and Zuhong Li  |            |
| <b>28</b> | <b>Research on GPS Receiver Autonomous Integrity Monitoring Based on Auxiliary Particle Filter . . . . .</b> | <b>337</b> |
|           | Ershen Wang, Tao Pang, Pingping Qu and Yongming Yang   |            |
| <b>29</b> | <b>Ranging Bias of COMPASS Satellite Signals . . . . .</b>   | <b>347</b> |
|           | Jiancheng Liu, Jianjun Fan, Xiaochao Feng and Huaisheng Sang   |            |
| <b>30</b> | <b>Research on the Dynamic Configuration of Air-Based Pseudolite Network . . . . .</b>                       | <b>357</b> |
|           | Da-peng Li, Ping-ke Deng, Bing Liu, Yi Qu, Ling-chuan Zeng and Ting Liu                                      |            |

### **Part III Satellite Navigation Models and Methods**

|           |  |            |
|-----------|--|------------|
| <b>31</b> | <b>An Improved GNSS Global Ionospheric Model . . . . .</b>   | <b>371</b> |
|           | Dun Liu, Xiao Yu, Liang Chen and Weimin Zhen   |            |
| <b>32</b> | <b>A New Method for Direct Calculation of Ionospheric Delay . . . . .</b>  | <b>381</b> |
|           | Yadong Bao, Changjian Liu, Hongzhou Chai and Chen Liu  |            |
| <b>33</b> | <b>Precision Analysis of Wide-Area Ionospheric Correction Triangular Partition Method in Low Latitudes . . . . .</b> | <b>389</b> |
|           | Chao Xi, Chenglin Cai and Zhaochuan Wei  |            |
| <b>34</b> | <b>Analysis of Positioning Performance on Combined BDS/GPS/GLONASS . . . . .</b>                                     | <b>399</b> |
|           | Xiaosan Man, Fuping Sun, Shuai Liu, Haifeng Li and He Ding   |            |
| <b>35</b> | <b>A Real-Time Prediction Algorithm of BDS Satellite Clock Offset Considering Phase Jumps . . . . .</b>              | <b>411</b> |
|           | Wenju Fu, Qin Zhang, Meng Ao, Guanwen Huang and Hairong Guo  |            |
| <b>36</b> | <b>The Orbit and Clock Combination of iGMAS Analysis Centers and the Analysis of Their Precision . . . . .</b>       | <b>421</b> |
|           | Kangkang Chen, Tianhe Xu, Guo Chen, Jiajing Li and Sumei Yu  |            |

|           |   |            |
|-----------|---|------------|
| <b>37</b> | <b>Regional Modeling of Atmosphere Delay in Network RTK Based on Multiple Reference Station and Precision Analysis. . . . .</b>     | <b>439</b> |
|           | Bo Wu, Chengfa Gao, Shuguo Pan, Jiadong Deng and Wang Gao   |            |
| <b>38</b> | <b>Reliable RTK Positioning Method Based on Partial Wide-Lane Ambiguity Resolution from GPS/GLONASS/BDS Combination. . . . .</b>    | <b>449</b> |
|           | Wang Gao, Chengfa Gao, Shuguo Pan, Yang Yang and Denghui Wang   |            |
| <b>39</b> | <b>Optimal Kalman Filtering in the Presence of Time-Correlated Process Noise . . . . .</b>  | <b>461</b> |
|           | Zebo Zhou, Yunlong Wu and Hua Chai  |            |
| <b>40</b> | <b>Prediction and Analysis of Chinese Earth Rotation Parameters Based on Robust Least-Squares and Autoregressive Model. . . . .</b> | <b>477</b> |
|           | Zhangzhen Sun, Tianhe Xu, Bing He and Gang Ren  |            |
| <b>41</b> | <b>Research on the Selection Method of Triple Frequency Combination Based on the Beidou Satellite Navigation System . . . . .</b>   | <b>487</b> |
|           | Rui Xue, Qingming Cao, Qiang Wei and Yanbo Sun  |            |
| <b>42</b> | <b>A Baseline Ambiguity Resolution Using Un-combined and Un-differenced Model with Equality Constraint. . . . .</b>                 | <b>499</b> |
|           | Denghui Wang, Chengfa Gao, Shuguo Pan and Wang Gao  |            |
| <b>43</b> | <b>Using IGMAS/MGEX Ground Tracking Station Data to Solve the Global Beidou Satellite DCB Products. . . . .</b>                     | <b>511</b> |
|           | Junqiang Han, Qin Zhang, Guanwen Huang and Jin Wang   |            |
| <b>44</b> | <b>BeiDou Satellite Navigation System (BDS) Real-Time Orbit Determination and Accuracy Analysis . . . . .</b>                       | <b>523</b> |
|           | Le Wang, Qin Zhang, Guanwen Huang, Rui Zhang and Xingyuan Yan   |            |
| <b>45</b> | <b>Periodic Oscillation Analysis of Gps Height Time Series Based on HHT . . . . .</b>   | <b>533</b> |
|           | Xiaolei Wang, Qin Zhang, Lidu Zhao and Shuangcheng Zhang  |            |

|           |  |            |
|-----------|--|------------|
| <b>46</b> | <b>Analysis of Ionosphere Modeling Accuracy Based on Multi-GNSS Data. . . . .</b>  | <b>545</b> |
|           | Yongxing Zhu, Xiaolin Jia, Laiping Feng and Rengui Ruan  |            |
| <b>47</b> | <b>Precision Assessment of Broadcast Ionospheric Model of GNSS Based on Real Data of Base Station. . . . .</b>                 | <b>553</b> |
|           | Na Cheng, Xiao-lin Jia and Da-wei Sun  |            |
| <b>48</b> | <b>The Characteristics Investigation of Ground-Based GPS/PWV During the “7.21” Extreme Rainfall Event in Beijing . . . . .</b> | <b>563</b> |
|           | Binyan Wang, Linna Zhao and Xuemei Bai   |            |
| <b>49</b> | <b>Instantaneous and Controllable GNSS Integer Aperture Ambiguity Resolution with Difference Test. . . . .</b>                 | <b>575</b> |
|           | Jingyu Zhang, Meiping Wu and Kaidong Zhang   |            |
| <b>50</b> | <b>Can BDS Improve Tsunami Early Warning in South China Sea? . . . . .</b>   | <b>593</b> |
|           | Kejie Chen, Natalia Zamora, Andrey Babeyko and Maorong Ge  |            |
| <b>51</b> | <b>GTm_X: A New Version Global Weighted Mean Temperature Model . . . . .</b>   | <b>605</b> |
|           | Peng Chen and Wanqiang Yao   |            |
| <b>52</b> | <b>Multi-GNSS PPP and PPP-RTK: Some GPS+BDS Results in Australia . . . . .</b>   | <b>613</b> |
|           | Dennis Odijk, Baocheng Zhang and Peter J.G. Teunissen  |            |

China Satellite Navigation Conference (CSNC) 2015

Proceedings: Volume II

Sun, J.; Liu, J.; Fan, S.; Lu, X. (Eds.)

2015, XVIII, 623 p. 336 illus., Hardcover

ISBN: 978-3-662-46634-6