

## Application of Difference Methods in Surveying

*Zhao Dong-ming<sup>1,2</sup>*

*Associate Professor,*

*1. Surveying and Mapping Institute, Wuhan University, Hubei Province, China*

*2. Department of Geodesy and Engineering,*

*Zhengzhou Institute of Surveying and Mapping*

*No.66#, Longhai Middle Road, Post code:450052, Zhengzhou, Henan Province, China*

*Email: [geozdm0@gmail.com](mailto:geozdm0@gmail.com) or [geo\\_zdm0@yahoo.com.cn](mailto:geo_zdm0@yahoo.com.cn)*

*Wu Xiao-ping*

*Professor,*

*Department of Geodesy and Engineering,*

*Zhengzhou Institute of Surveying and Mapping*

*Post code:450052, Zhengzhou, Henan Province, China*

*Email: [geowxp@gmail.com](mailto:geowxp@gmail.com)*

*Bao Huan*

*Associate Professor, Instrument Center,*

*Zhengzhou Institute of Surveying and Mapping*

*Post code: 450052, Zhengzhou, Henan Province, China*

*Email: [baoyinghuan@yahoo.com.cn](mailto:baoyinghuan@yahoo.com.cn) or [baoyinghuan@gmail.com](mailto:baoyinghuan@gmail.com)*

*Cai Zhi-wu*

*Doctor, Global Information*

*Application and Development Center of Beijing*

*Post code: 100094, Beijing, China*

*Email: [caizhiwu@gmail.com](mailto:caizhiwu@gmail.com)*

*Li Shan-shan*

*Associate Professor,*

*Department of Geodesy and Engineering,*

*Zhengzhou Institute of Surveying and Mapping*

*Post code:450052, Zhengzhou, Henan Province, China*

*Email: [geolss@gmail.com](mailto:geolss@gmail.com)*

**Abstract** The paper reviews applications of difference-making methods used in GPS surveying and light-beam range finder measurement, and analyzes the advantages brought by difference-making, such as elimination of many kinds of errors that stems from both instruments and observations, and points out that the purpose of making difference is to eliminate both known and unknown common errors and thus improve measurement accuracy. Then by analogy the paper proposes Real-time Automatic Polar Coordinates Difference (RAPCD) method in deformation monitoring, which concentrates on three applications of the difference method in skew distance correction, earth-atmosphere difference correction, and azimuth correction, and the author presents relevant formulae for actual computations. And the method has been successfully applied in practical work, for example, the author has developed the software named “Automatic Deformation Monitoring System---ADMS” and has successfully applied it in a lot of engineering projects such as the Automatic Deformation











