

應用經驗正交函數法分析及預測 GPS 連續站位移變化

Displacement Analysis and Prediction of Continuous GPS Stations Using Empirical Orthogonal Function

康寧凱¹ 高豫麒² 李旭志³
Ning-Kai Kang Yu-Chi Kao Hsu-Chih Lee

摘要

由於臺灣位處板塊交界處，不僅板塊運動劇烈，也因地質構造的特性，常有許多斷層活動，造成地震頻繁，無不影響人民生命財產安全。因此，許多機關、單位紛紛建立 GPS 連續站，透過長期累積之觀測資料期望找出其變化並進行預測，並也累積相當的成果。本研究透過大氣科學領域常用之經驗正交函數 (Empirical Orthogonal Function, EOF) 以空間函數及時間序列變化分析 GPS 連續站每日解坐標，瞭解其位移變動情形與各項參數之關係，並藉由分解所得函數預測點位未來之變動情形，作為未來地殼變動、坐標系統建立相關評估參考。以 2010 年 3 月至 2012 年 2 月共計 2 年之資料進行分析結果，對於未來 1 年之坐標預測結果，其 EW 及 NS 方向平均誤差分別約為 2.2mm 及 1.1mm，而 RMS 則為 11.4mm 及 7mm。

關鍵詞：GPS連續站、坐標系統、經驗正交函數

Abstract

Taiwan is located at the collision zone between Eurasian Continental plate and Philippine Sea plate. The plate movement causes fault activities and makes earthquakes occur frequently. It affects the safety of people's lives and properties. Consequently, many agencies and units make efforts to estimate and predict the plate movement through establishing continuous GPS stations and analyzing long-term observation data. In this research, Empirical Orthogonal Function(EOF) which analysis data with spatial function and time series function mostly used in atmospheric sciences is adopted. The relationships between displacement of continuous GPS stations and parameters of EOF can be obtained from analyzing daily coordinates of continuous GPS stations and it is able to predict the displacement of continuous GPS stations via time series function in the future. The outcomes will be helpful to coordinate systems establishment and estimation of crustal movements. According to research methods and analyzing continuous GPS stations observations during March 2010 to February 2012, the

¹ 內政部國土測繪中心 技士

² 逢甲大學都市計畫與空間資訊學系 助理教授

³ 內政部國土測繪中心 課長

coordinates of the coming year are predicted. The predicted coordinates are compared with coordinates calculated from continuous GPS stations observations. The results have shown that the average errors of East-West and North-South axial direction are 2.2mm and 1.1mm, and its RMS are 11.4mm and 7mm.

Keywords: Continuous GPS Stations, Coordinate Systems, Empirical Orthogonal Function