

Motion-Induced Voltages from In-Service Undersea Telephone Cables

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ABSTRACT

The measurement of voltages caused by ocean motion provides a means for continuously monitoring ocean volume transport (Flosadottir, Larsen and Smith, 1997a). A method is described for correcting the voltages observed from in-service telephone cables in order to determine the daily mean motion-induced voltages. The corrections include the removal of changes in the power current and temperature, the removal of geomagnetic induced variations, and the removal of tidal variations. The correction method was developed for voltages observed across the Straits of Florida and are applied here to voltages observed between Okinawa and Taiwan using a powered undersea in-service telephone cable.

(Keywords: under telephone cable, volume transport)

INTRODUCTION

Voltages using undersea telephone cables contain signals caused by ocean motion, ionospheric and magnetospheric electric currents, chemical and temperature changes at the cable ocean contacts and, in the case of powered cables, changes in the power current, and resistance of the power separation filter. Changes in resistance are monitored by measuring the temperature near the power separation filter (Flosadottir, Larsen and Smith, 1997b). These power separation filters are not used for fiber optic cables, which eliminates the need for temperature measurements. Noise due to the cable ocean contacts can be monitored and removed by observing the voltage between the cable ocean contact and a good reference electrode such as a silver/silver-chloride electrode installed in the ocean. The geomagnetic induced voltages are removed using a land-based magnetic site which is free of the motional induced signals, and transfer functions that convert the geomagnetic induced magnetic variations into geomagnetic induced cable voltages.

We first describe the removal of variations due to changes in the power current, then the removal of geomagnetic induced variations, and finally the removal of tidal variations. We use

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