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Tidal Force Leap May Cause Malignant Impact on Zener Standard Measurement and Even Aircraft Instrumentation System

By Ling-Xiang Liu

Introduction- From 1996 to 1997, the National Metrology Centre of Singapore (NMC) coordinated the 3rd Asia Pacific Metrology Program (APMP) comparison of dc voltage using a Zener traveling standard. The comparison results at 1.018 V showed a zigzag curve among those laboratories that used their Josephson Array Voltage Standards (JAVSs) for this comparison. The amplitude of the zigzag was more than 1 part in 10^7, much larger than the typical uncertainty of such standards. These results motivated NMC to search for an explanation, which finally led to the development of an approximate mathematical model to describe this phenomenon [1]. During this developing period a surprising phenomenon was observed: Continuously measured dc voltage output with a periodic fluctuation pattern correlated with the times of tide high and tide low [2]. In addition to this, [2] also mentioned another observation that some of measurements carried out exhibit vast errors during spring tide. Through water molecules' adsorption or desorption on the insulation of a wiring harness forming the voltage divider, which is situated in an air sealed thermostat of a measured Zener cell, the dc voltage output was very strongly disturbed by spring tides.

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I. Introduction

From 1996 to 1997, the National Metrology Centre of Singapore (NMC) coordinated the 3rd Asia Pacific Metrology Program (APMP) comparison of dc voltage using a Zener traveling standard. The comparison results at 1.018 V showed a zigzag curve among those laboratories that used their Josephson Array Voltage Standards (JAVSs) for this comparison. The amplitude of the zigzag was more than 1 part in 10^7, much larger than the typical uncertainty of such standards. These results motivated NMC to search for an explanation, which finally led to the development of an approximate mathematical model to describe this phenomenon [1]. During this developing period a surprising phenomenon was observed: Continuously measured dc voltage output with a periodic fluctuation pattern correlated with the times of tide high and tide low [2]. In addition to this, [2] also mentioned another observation that some of measurements carried out exhibit vast errors during spring tide. Through water molecules' adsorption or desorption on the insulation of a wiring harness forming the voltage divider, which is situated in an air sealed thermostat of a measured Zener cell, the dc voltage output was very strongly disturbed by spring tides.

Also, in 2002, there were some reports of more amazing effects due to tidal changes: Hinderer *et al.* reported tides, earthquakes, and ground noise as seen by the absolute gravity measurements using different measurement methods: The results have very evidently shown the tidal gravity change in Strasbourg in June 1997 as an example [3]. Kasahara explains in his Perspective: Studies provide evidence that tidal forces influence earthquakes associated with volcanic activity, and new results from the Juan de Fuca Ridge in the Pacific show an obvious diurnal pattern attributed to ocean tides [4].

It is worth for a further consideration: there may be a terrible impact on some elements; especially they have a crucial function in a very powerful system; when, a spring tide, earthquake, or any other acute external condition change is just coming, it may cause a catastrophe! A sensitive example that should attract attention is the issue of safe flight of passenger airlines regarding aircraft instrumentation. The pilot's dependence on flight instruments is relatively high, because they often wholly lose the external visual reference. Most, the aircraft instrumentation system becomes their only source of visual information to determine the aerodynamic state of the aircraft.

Measurements of an airplane's speed, altitude, and angle of attack, for instance, are imperative. Usually, the airspeed indicator works by comparing dynamic pressure from the pitot tube and static pressure; measuring the air pressure is a simple and effective way of measuring altitude, and,; the angle of attack can be measured using a mechanical wind vane. Tidal forcing of airplane's instrumentation may not be more insensitive than of Zener measurement, and of zone earthquakes with volcanic activity. When a spring tide, earthquake or any other acute external condition change is just coming, especially on the Pacific "Ring of Fire," where Earth plate collisions, volcanic eruptions, tsunamis, and earthquakes are frequent, what would happen: the cockpit controls would be overwhelmed and even totally at a loss. Maybe that is why Boesser has so suggested [5]: While detailed causes of the stalls often vary, it is assumed by the General Aviation Joint Steering Committee (GAJSC) in 2012 that a significant contributing factor to some stall accidents may be a deficit in the pilot's aerodynamic state awareness caused by limitations or gaps in aircraft instrumentation.

To compensate for the deficit mentioned by GAJSC, it may be more helpful for the judgment of pilots when they encounter abnormal instrumentation indications: If an instrument based on entirely different physical working principle can be introduced into the instrumentation system or just as a reference, for example, a laser airspeed sensing instrument. A reliable instrumentation system with anti-interference ability is the most crucial fundamental trust to allow pilots to fly safely for either automatic or manual control even when they cannot see the ground or horizon. From the latest media reports, "The number of deaths from global plane crashes rose sharply in 2018", a revelation would be: To make the aircraft instrumentation more reliable.

The largest annual tidal range can be expected around the time of the equinox if it coincides with a

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spring tide. Recent China Eastern Airlines Flight 5735 crashed on March 21, 2022 (all 132 victims on board were confirmed, including 123 passengers and nine crew members), seems to fit this annual spring tidal force-time pattern:

According to the Chinese lunar calendar:

Spring equinox: March 20, 2022, at 23:29

Perigee spring tide: March 21, 2022, at 14:05

(based on the data of the world's largest astronomical tide spectacle — — Qiantang River tide in Zhejiang province of China [6]);

Flight 5735 departed Kunming Changshui International Airport, at 13:15 for Guangzhou Baiyun International Airport scheduled to land at 15:05, and crashed in the mountainous regions of Teng County, *Guangxi Zhuang Autonomous Region:*

March 21, 2022, at 14:22.

Usually, high tides are called **spring tides,** but they have nothing to do with the season. Perhaps the name comes from the German word "**Springen**," meaning **"to leap."**

The most extensive annual tidal range, namely, the most giant tidal force leap, may cause the pilot's aerodynamic state awareness to stuck in blind spot, even under an automatic control, it is not impossible, suddenly to enter an almost vertical dive, until the horizon being vaguely recognized, it seems too late to try a cockpit manual control — unable to return to the sky.

Maybe in this way, really a gravitational force jump may cause a malignant impact on an aircraft instrumentation system and, therefore, on flight safety, finally leading to a catastrophe.

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