Comments on "The Pioneer Anomaly: an inconvenient reality or NASA's 12 year misconception"

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Abstract

Paul ten Boom (arXiv:1307.0537[physics.gen-ph]) suggested the recent publications of the thermal recoil force causing the Pioneer Anomaly (PA) are questionable. *Only one* model presented to date is consistent with *all* 12 PA characteristics (Hodge http://arxiv.org/abs/astro-ph/0612567). This proposed model supports a reductive philosophy. Paul ten Boom did not discuss this model but did conclude the PA should remain an open issue. All other proposed models are inconsistent with some PA data. The PA is a case where conservatism should yield to observation and a reductive model that explains the observation.

KEYWORDS Pioneer Anomaly; fundamental physics

1 INTRODUCTION

Anderson et al. (2002) reported on the analysis of recovered Pioneer 10 (P10) and Pioneer 11 (P11) flight data. There are 12 characteristics of the Pioneer Anomaly (PA) that *must* be explained by a candidate model (Hodge 2009).

Turyshev and Toth (2012) supported a model suggesting a thermal recoil force caused the P10 anomalous acceleration. However, Turyshev and Toth (2012) dealt with only the P10 and only the "acceleration" value. Much of the data used to calculate the forces are less well known or supported by other data. Although unlikely, a currently unknown other systematics effect is not entirely ruled out. Although incomplete, the thermal recoil force hypothesis has become a strongly preferred option by conservative science (ten Boom 2013, and references therein).

Paul ten Boom (ten Boom 2013) suggested the recent publications of the thermal recoil force causing the Pioneer Anomaly are questionable, suggested

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a non-sytematic effect is unlikely, and concluded the dismissal of the PA as a physical observation that physics should explain is unwise. ten Boom (2013) noted John D. Anderson in a recent interview argued "...that the new analysis has mis–modelled the solar radiation pressure." Paul ten Boom failed to discuss the *only* model presented to date that is consistent with *all* the characteristics (Hodge 2006b, 2013).

This paper expands ten Boom (2013) and notes a model has been proposed that describes the PA. The comments are in Section 2. The conclusion is in Section 3.

2 COMMENTS

A lower anomaly occurred during the Saturn encounter of P11. Also, the P11 values were slightly different than the P10 data. The P10 data at the furthest distance flattened and increased (but within experimental uncertainty) which is inconsistent with a declining thermal cause. The cosmological connection is unexplained by the thermal model. The solar and sidereal diurnal periodicities are unexplained by a thermal model Also, Turyshev and Toth (2012) shows the early data point recently calculated.

ten Boom (2013) stated "A non-heat based approach is unconventional and (to date) its supporters have failed to deliver a fully viable and/or well-received hypothesis." An unconventional model has been presented in Hodge (2006b) and some of its predictions later confirmed by Turyshev and Toth (2009) and by Turyshev et al. (2011) (Hodge 2013). Bertolami and Páramos (2004) concluded a scalar field is able to explain the PA. A scalar potential model (Hodge 2006b) is consistent with *all* the PA characteristics including a cosmological connection and variable measured values. This model was omitted from the analysis. All models considered conventional today were unconventional when first introduced.

That the PA is an acceleration of the spacecraft is unproven. The PA is measured by an unexplained frequency blueshift in the radio signal. The " acceleration" nomenclature is based on the unsupported hypothesis that the frequency shift is a Doppler effect and on an analysis showing lack of a conventional physics explanation for a frequency blueshift (Anderson et al. 2002). Other phenomena cause frequency shifts of electromagnetic signals (light) such as gravity using the Weak Equivalence Principle as shown in the Pound-Rebka experiment (Pound & Rebka 1960) and the galaxy redshift z of cosmology (Hodge 2006a, an unconventional model).

The greater number of pioneer maneuvers, the greater solar pressure on the spacecraft closer to the Sun, and the age of the earlier PA data cause the earlier data that resulted in the thermal model and confirmation of the predictions of the new physics model to be of low quality (ten Boom 2013). However, this is more than compensated by the reductionist philosophy of the proposed model. The PA is only one of three sets of different types of observations suggesting the same new physics model. The PA is the galaxy redshift model without the

galaxies influence. It has the influence of only the masses of the planets and Sun. The Pound–Rebka experiment is the galaxy redshift model with the influence of only the Earth's mass. Therefore, instead of questioning the viability of the reductive agenda, the proposed model supports a reductive philosophy.

3   CONCLUSION

As ten Boom (2013) stated "...but ultimately, hard won observational evidence should be a physicist's first priority." The PA is a case where conservatism should yield to observation and a reductive model that explains the observation.

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