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# Determination of Prominence Plasma $\beta$ from the Dynamics of Rising Plumes

Andrew Hillier<sup>\*1</sup>, Richard Hillier<sup>2</sup>, and Durgesh Tripathi<sup>3</sup>

<sup>1</sup>Kwasan Observatory, Kyoto University (Kwasan Obs.) – 17-1 Kitakazan-ohmine-cho, Yamashina-ku, Kyoto, 607-8471, Japan

<sup>2</sup>Department of Aeronautics, Imperial College – Department of Aeronautics, Imperial College, London, United Kingdom

<sup>3</sup>Inter-University Centre for Astronomy and Astrophysics (IUCAA) – Inter-University Centre for Astronomy and Astrophysics, Post Bag 4, Ganeshkhind, Pune 411 007, India

## Abstract

The launch of Hinode satellite gave high resolution observations of rising plumes, dark in chromospheric lines, in quiescent prominences that propagate from large bubbles that form at the base the prominences. These plumes present a very interesting opportunity to study Magnetohydrodynamic (MHD) phenomenon in quiescent prominences, but obstacles still remain. One of the biggest issues is that of the magnetic field strength, which is not easily observable in prominences.

In this paper we present a method that may be used to determine the plasma  $\beta$  (ratio of gas pressure to magnetic pressure) when rising plumes are observed. Using the classic fluid dynamic solution for flow around a circular cylinder, the compression of the prominence material can be estimated. This has been successfully confirmed through simulations, and application to a prominence gave an estimate of the plasma  $\beta$  as  $\beta=0.47 - 1.13$  for a ratio of specific heats of 1.4 - 1.7.

Using this method it may be possible to estimate the magnetic field of observed prominences, therefore helping our understanding of a prominence's dynamics in terms of MHD phenomenon.

**Keywords:** MHD, Prominence magnetic field, plumes

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<sup>\*</sup>Speaker