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THE ASTROPHYSICAL JOURNAL LETTERS

EVIDENCE OF FANNING IN THE OPHIUCHUS STREAM

Branimir Sesar¹, Adrian M. Price-Whelan², Judith G. Cohen³, Hans-Walter Rix¹, Sarah Pearson², Kathryn V. Johnston², Edouard J. Bernard⁴, Annette M. N. Ferguson⁴, Nicolas F. Martin^{1,5}, Colin T. Slater⁶ [Show full author list](#)

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Author e-mails

bsesar@mpia.de

Author affiliations

¹ Max Planck Institute for Astronomy, Königstuhl 17, D-69117 Heidelberg, Germany

² Department of Astronomy, Columbia University, 550 West 120th Street, New York, NY 10027, USA

³ Division of Physics, Mathematics and Astronomy, California Institute of Technology, Pasadena, CA 91125, USA

⁴ SUPA, Institute for Astronomy, University of Edinburgh, Royal Observatory, Blackford Hill, Edinburgh EH9 3HJ, UK

⁵ Observatoire Astronomique de Strasbourg, Université de Strasbourg, CNRS, UMR 7550, 11 rue de l'Université, F-67000 Strasbourg, France

⁶ Department of Astronomy, University of Michigan, 1085 S. University Ave., Ann Arbor, MI 48109, USA

⁷ Institute for Astronomy, University of Hawaii at Manoa, Honolulu, HI 96822, USA

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Abstract

The Ophiuchus stellar stream presents a dynamical puzzle: its old stellar populations (~ 12 Gyr) cannot be reconciled with (1) its orbit in a simple model for the Milky Way potential and (2) its short angular extent, both of which imply that the observed stream formed within the last < 1 Gyr. Recent theoretical work has shown that streams on chaotic orbits may abruptly fan out near their apparent ends; stars in these fans are dispersed in both position and velocity and may be difficult to associate with the stream. Here we present the first evidence of such stream-fanning in the Ophiuchus stream, traced by four blue horizontal branch stars beyond the apparent end of the stream. These stars stand out from the background by their high velocities ($v_{\text{los}} > 230 \text{ km s}^{-1}$) against ~ 40 other stars: their velocities are comparable to those of the stream, but would be exceptional if they were unrelated halo stars. Their positions and velocities are, however, inconsistent with simple extrapolation of the observed cold, high-

density portion of the stream. These observations suggest that stream-fanning may be a real, observable effect and, therefore, that Ophiuchus may be on a chaotic orbit. They also show that the Ophiuchus stream is more extended and hence dynamically older than previously thought, easing the stellar population versus dynamical age tension.

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