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Revealing Clumps in the Changing Structure of Type-Ib SN 2012au

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SN 2012au is a key intermediate object between Type Ib supernovae (SNe), superluminous SNe and the highly-energetic, hypernovae. This unusual SN had a higher mass loss rate than other hypernovae but likely arose from a progenitor star of about 80 solar masses. These two findings contradict previous theories that more massive stars could not produce such an explosion, suggesting that a jet-powered mechanism caused SN 2012au. I present 6 epochs of spectropolarimetric data for SN 2012au observed by the Supernova Spectropolarimetry Project between 0 and 295 days post-maximum brightness. The unique combination of polarization information with multi-observation spectra gives us a detailed picture of the distribution of elements in the explosion and how these structures change over time. Spectropolarimetry is a powerful piece of the multi-messenger toolkit that enables us to identify individual components in the SN's geometry, such as clumps and jets that otherwise cannot be resolved. Our spectropolarimetric data show that SN 2012au exhibited a dominant axis in early epochs, which is associated with a jet-like feature. We also see signatures in the helium line polarization that suggests this material is distributed in clumps with a different symmetry axis than the jets. By comparing our observations with radiative transfer models, we offer a picture of the structure of SN 2012au and discuss the implications our findings have for this unique breed of supernova.

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