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Magnetic Untwisting in Most Solar X-Ray Jets

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From 54 X-ray jets observed in the polar coronal holes by *Hinode's* X-Ray Telescope (XRT) during coverage in movies from *Solar Dynamic Observatory's* Atmospheric Imaging Assembly (AIA) taken in its He II 304 Å band at a cadence of 12 s, we have established a basic characteristic of solar X-ray jets: untwisting motion in the spire. In this presentation, we show the progression of few of these X-ray jets in XRT images and track their untwisting in AIA He II images. From their structure displayed in their XRT movies, 19 jets were evidently standard jets made by interchange reconnection of the magnetic-arcade base with ambient open field, 32 were evidently blowout jets made by blowout eruption of the base arcade, and 3 were of ambiguous form. As was anticipated from the >10,000 km span of the base arcade in most polar X-ray jets and from the disparity of standard jets and blowout jets in their magnetic production, few of the standard X-ray jets (3 of 19) but nearly all of the blowout X-ray jets (29 of 32) carried enough cool ($T \sim 10^5$ K) plasma to be seen in their He II movies. In the 32 X-ray jets that showed a cool component, the He II movies show 10-100 km/s untwisting motions about the axis of the spire in all 3 standard jets and in 26 of the 29 blowout jets. Evidently, the open magnetic field in nearly all blowout X-ray jets and probably in most standard X-ray jets carries transient twist. This twist apparently relaxes by propagating out along the open field as a torsional wave. High-resolution spectrograms and Dopplergrams have shown that most Type-II spicules have torsional motions of 10-30 km/s. Our observation of similar torsional motion in X-ray jets strengthens the case for Type-II spicules being made in the same way as X-ray jets, by blowout eruption of a twisted magnetic arcade in the spicule base and/or by interchange reconnection of the twisted base arcade with the ambient open field.

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