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Non-linear self-trapping of ultra cold atoms in two dimensions TOSHIYA KINOSHITA, TREVOR WENGER, DAVID S. WEISS, Physics Department, Pennsylvania State University — We dynamically observe a non-linear selftrapping transition in a 2D optical lattice. Quantum degenerate atoms are confined by a dipole trap in the middle of a much larger 2D optical lattice. When the dipole trap is turned off, the atoms are self-trapped in a ring of 1D tubes when the difference in mean field energy between adjacent tubes is sufficiently larger than the tunneling energy. Because the atoms are free to expand ballistically perpendicular to the lattice plane, the density eventually drops below the critical self-trapping density. At that point the atoms can tunnel between the tubes, so they suddenly start to expand transversely in the lattice plane.

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