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Self-assembly of environmental adsorbates on graphene and other 2D materials

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Graphene sheets on atomically flat substrates are expected to be flat. Yet recent studies of nominally flat graphene using high-resolution atomic force microscopy have revealed an apparently corrugated surface: topography scans show large-scale periodic structures of stripes whose period is 4 nm and whose amplitude can be a few tenths of a nanometer. I will present scanning probe and optical measurements that show that these stripes are self-assembled environmental adsorbates, the chemical identity of which is still under study. This self-assembly appears to be common on 2D materials, as the same phenomenon occurs on sheets of hexagonal boron nitride, and 4 nm-periodic stripes were recently observed on molybdenum disulfide by another group. I will discuss the impact of the self-assembled stripes on the frictional, optical, and electronic properties of graphene samples.