Global relaxation of the stretched magnetotail during substorms consists of elementary dipolarization processes, each of which is marked by a sharp increase of the north magnetic field component followed by a shallower decrease. These structures known as dipolarization fronts (DF) are embedded into fast plasma flows. They bring hot tenuous plasmas with the enhanced magnetic flux from the mid tail to the near-Earth region. Recent THEMIS observations clearly showed, that while the characteristic scale size of DFs along the tail is microscopic (comparable to or less than the thermal ion gyroradius), they propagate throughout the whole macroscopic magnetotail without any significant change in their structure, just like solitons or shocks. DFs can be reproduced in full-particle simulations of magnetic reconnection with open boundaries. They represent a new regime of unsteady magnetic reconnection, different from the more conventional magnetic island formation. DFs have also signatures of the current disruption phenomenon, because they do not change the original magnetotail topology. They have complicated current sheet structure with a thin current sheet embedded into a thicker plasma sheet ahead of the DF and a bifurcated current sheet behind it. The enhanced magnetic field and reduced plasma density inside a DF result in the reduced entropy per unit magnetic flux, making it a buoyant plasma bubble. It is shown, that the accumulation of the magnetic flux at the tailward end of the thin magnetotail current sheet prior to a substorm favors the formation of DFs.