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Making the corona and the solar wind via nonlinear Alfven waves from the photosphere

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We show that Alfven waves naturally explain the heating and acceleration of the coronal plasma in open field regions by 1D numerical simulations from the photosphere to 65 Rsun (0.3AU). Alfvenic perturbations with dv˜1km/s and period of 20 sec. to 30 min. are input at the photosphere. Through the upward propagation, the wave amplitude is amplified in the stratified atmosphere to generate compressive MHD waves by the nonlinear effects. The compressive waves steepen and eventually dissipate by both fast and slow shocks. Density fluctuations accompanying the compressive modes further contribute to reflection of the outgoing Alfven waves and the excited incoming waves eventually dissipate through wave-wave interactions. Thus, the most of the input Alfven wave energy effectively dissipate within the computational region, which directly leads to the heating ($>$ 1MK) and acceleration (300 - 800km/s) of the coronal plasma.