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# Flux emergence and the state of the outer solar atmosphere

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The dynamical evolution of the solar magnetic field(s) is a key ingredient in understanding the ubiquitous observed activity in the Sun. A fundamental process, which is responsible for this dynamical evolution, is the emergence of magnetic flux from the solar interior to the outer solar atmosphere. The cost of running realistic numerical models is no longer prohibitive in studying the rising of magnetic flux through the last 10-20 Mm of the solar convection zone and into the outer atmosphere. We review observational constraints on the flux emergence process and current and future modelling efforts using high performance computational resources and techniques. We will especially concentrate on the comparison between model generated synthetic observables against observed spectral signatures. We will discuss how MUSE observations of flux emergence will improve our understanding of solar and stellar magnetic fields and their role in producing the coronal field, igniting flares, and energising chromospheres and coronae and we will discuss what developments in modelling are necessary to form a coherent picture of these complex phenomena.

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