

A generic Gushel-Mukai fourfold is a smooth four-dimensional quadric section of a linear section of the Grassmannian  $\text{Gr}(2,5)$ . These Fano fourfolds have recently attracted a lot of interest due to their similarities with cubic fourfolds. For instance, their rationality is conjecturally equivalent to the condition of having an associated K3 surface. In this talk, we consider Gushel-Mukai fourfolds admitting an associated K3 surface and we study the relations arising on the level of moduli spaces and period domains. In analogy to Hassett's work for cubic fourfolds, we introduce the notions of marked and labelled Gushel-Mukai fourfolds, showing that in this case they are equivalent. Then we use this to construct rational maps from the moduli stack of special GM fourfolds with discriminant  $d$  and associated K3 surface to the moduli space of polarized degree- $d$  K3 surfaces. As an application, we study Fourier-Mukai partners of very general special Gushel-Mukai fourfolds. This is a joint work with Emma Brakkee.