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Stable Wild Vafa-Witten Bundles on \mathbb{P}^2

Vafa-Witten bundles were originally introduced in the study of S-duality in $\mathcal{N} = 4$ supersymmetric Yang-Mills theory. Specifically, on a Kähler surface X , a Vafa-Witten bundle is a pair (E, Φ) where E is a holomorphic vector bundle on X and $\Phi \in H^0(X, \text{End}E \otimes K_X)$ called the *Higgs field*. It is known that when $X = \mathbb{P}^2$, non-trivial stable Vafa-Witten bundles do not exist under the standard definition. They do emerge when considering the "wild" case, where in the definition of the Higgs field, one replaces the canonical bundle $K_{\mathbb{P}^2}$ with any line bundle L on \mathbb{P}^2 . In this talk, we describe the geometry of moduli spaces of rank-two stable wild Vafa-Witten bundles over \mathbb{P}^2 .