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Critical values for the moduli space of symplectic balls in a rational 4-manifold

(joint work with Martin Pinsonnault)

We compute the rational homotopy type of the space of symplectic embeddings of the standard ball $B^4(c) \subset \mathbf{R}^4$ into 4-dimensional rational symplectic manifolds of the form $M_\lambda = \big(S^2 \times S^2, (1+\lambda)\omega_0 \oplus \omega_0\big)$ where ω_0 is the area form on the sphere with total area 1 and λ belongs to the interval $[0,1]$. We show that, when λ is zero, this space retracts to the space of symplectic frames, for any value of c. However, for any given $\lambda > 0$, the rational homotopy type of that space changes as c crosses the critical parameter $c_{\rm crit} = \lambda$, which is the difference of areas between the two S^2 factors. We prove moreover that the full homotopy type of that space change only at that value, *i.e.* the restriction map between these spaces is a homotopy equivalence as long as these values of c remain either below or above that critical value. The same methods apply as well to other rational 4-manifolds like CP^2 or the topologically non-trivial S^2-fibration over S^2.