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The rings of tautological differential forms on the moduli of marked Riemann surfaces

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The aim of this talk is to introduce a natural lifting, to the level of smooth real differential forms, of the systems of tautological rings in the real-valued cohomology of the moduli spaces of marked compact Riemann surfaces. The system of rings of tautological forms can be described as the smallest system of forms that is closed under all tautological pullbacks and submersions, and contains all natural 2-forms obtained from the normal function sections associated to variations of Hodge structures whose monodromy representation factors through a rational representation of the symplectic group. This realizes the map from tautological forms to tautological classes as an avatar of the "primary approximation" to the cohomology of the moduli space of (one-marked) Riemann surfaces constructed by Kawazumi-Morita. We will see that the rings of tautological forms are finite dimensional vector spaces. Also we characterize a certain real-valued invariant of compact Riemann surfaces found by Kawazumi as essentially the only smooth function on moduli space whose Levi form is tautological. This talk is based on joint work with Stefan van der Lugt.

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