In this paper we study the space of holomorphic n-differentials over Riemann surfaces of genus g for n \( \geq 1 \). We introduce a set of n vector bundles over this space, which we call Prym-Tyurin vector bundles. Corresponding determinant line bundles are called Prym-Tyurin line bundles. We define a set of n tau-functions on the space M and interpret them as holomorphic sections of tensor product of certain powers of Prym-Tyurin line bundles and tautological line bundle. This allows to express the first Chern classes of Prym-Tyurin line bundles (or Prym-Tyurin classes) via the boundary classes and the first Chern class of the tautological line bundle. The talk is based on joint work with Peter Zograf. (Received August 21, 2011)