In this paper, two of the leading specialists in the study of the diffeomorphism types of algebraic surfaces harvest the fruits of the very rapid development of the past decade. The final piece they contribute to the theory is the result that an orientation preserving diffeomorphism between two surfaces of general type with vanishing geometric genus defines a bijection between the sets of exceptional classes (modulo sign) of these surfaces and respects the pull back of the canonical class of the minimal model (modulo sign). This extends the corresponding results for Kähler surfaces with positive geometric genus. From this result the authors deduce that the plurigenera of a complex surface are diffeomorphism invariants. Results in this direction were obtained earlier with the aid of Donaldson invariants. The invention of Seiberg-Witten invariants simplified the technique a lot and brought a tool to solve some of the outstanding problems of the theory.

After reviewing the general theory of Seiberg-Witten invariants for Kähler metrics, the authors give a new proof of the above results in the case of positive geometric genus. After that, the main result is shown, that is the case of surfaces of general type with vanishing geometric genus. The completeness of this paper is achieved by the study of the remaining cases where the geometric genus vanishes but the surface is not of general type. For similar results see *R. Brussee* [New York J. Math. 2, 103-146 (1996; Zbl 0881.53057)] and *C. Okonek* and *A. Teleman* [C. R. Acad. Sci., Paris, Sér. I 321, No. 4, 457-461 (1995; Zbl 0867.14013)].

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MSC:

14J15	Moduli, classification: analytic theory; relations with modular forms
57R50	Differential topological aspects of diffeomorphisms
32J27	Compact Kähler manifolds: generalizations, classification

Cited in **3** Reviews
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Keywords:

Riemannian manifold; spinors; vortex equation; basic classes; positive scalar curvature; connected sum; algebraic surfaces; Seiberg-Witten invariants; orientation preserving diffeomorphism; Kodaira dimension

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