Gerbes, simplicial forms and invariants for families of foliated bundles

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This reports on some joint work with Franz W. Kamber. The notion of smooth Deligne cohomology is conveniently reformulated in terms of the simplicial deR-ham complex. In particular the usual Chern-Weil and Chern-Simons theory is well adapted to this framework and rather easily gives rise to characteristic Deligne cohomology classes associated to families of bundles and connections. In turn this gives invariants for families of foliated bundles. The construction provides representing cocycles in the usual Čech-deRham model for smooth Deligne cohomology called 'gerbes with connection' as they generalize usual Hermitian line bundles with connection. A special case is the Quillen line bundle associated to families of flat SU(2)-bundles.