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Geometry and Unitarity

D-module techniques were very successful in helping to understand representation theory of real reductive groups. Until recently, they failed to help in explaining unitarity phenomena. Recent work by Vogan and his coworkers, and Schmid and Vilonen suggests that a geometric explanation is possible. As an illustration, we are going to discuss some basic examples. In particular, we are going to give a simple proof of the classic Segal-von Neumann theorem that connected noncompact simple Lie groups have no nontrivial finite-dimensional unitary representations.