Analyticity and Regularity of Solutions of the 3D Navier-Stokes Equations

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Ever since the work of Foias and Temam in case of the Navier-Stokes equations (NSE), the use of Gevrey norms has become standard fare in estimating the radius of analyticity in various nonlinear evolution equations. Subsequent works have shown that Gevrey estimates can be used among other things to estimate the decay rate of higher order derivatives of solutions, establish exponential decay of the power spectrum and to study the global attractor. We discuss some recent results on the time evolution of the radius of analyticity for the 3D Navier-Stokes equations. This employs a “time varying” version of the Gevrey norm. Using this technique, we are able improve previously known lower bounds on the growth of the analyticity radius. Our investigation reveals a connection between the analyticity radius and the regularity problem for the 3D NSE. This is a joint work with Ciprian Foias.