Endpoint maximal regularity and application to a free boundary problem for the incompressible Navier-Stokes equation

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In this work in progress with M. Hieber, P. Mucha, Y. Shibata and P. Tolksdorf, we revisit Da Prato and Grisvard theory for bounded analytic semi-group and obtain new time independent maximal regularity estimates in suitable homogeneous spaces obtained by real interpolation. As an application, we consider the Stokes operator in the half-space supplemented with a Neumann-type boundary condition, then prove the global well-posedness of a free boundary problem for the incompressible Navier-Stokes equations in the case where, initially, the fluid domain is the half-space and the velocity is small.