Research Report（September, 2017 - September, 2018）

Enrollment from September 2017

Department of Mathematics   Hiroyuki TSURUMI

I.   List of Papers

・"Ill-posedness of the stationary Navier-Stokes equations in Besov spaces" (submitted)

・"The stationary Navier-Stokes equations in the scaling invariant Triebel-Lizorkin spaces" (submitted)

・"Well-posedness and ill-posedness of the stationary Navier-Stokes equations in toroidal Besov spaces" (submitted)

・"Well-poseness and ill-posedness problems of the stationary Navier-Stokes equations in scaling invariant Besov spaces" (submitted)

・"Counter examples of the bilinear estimates of the H¥"older type inequality in homogeneous Besov spaces" (submitted)

II. List of Talks

・"Ill-posedness of the stationary Navier-Stokes equations in homogeneous Besov spaces", 『若手による流体力学の基礎方程式研究集会』, Nagoya University, January, 2018.

・"Well-posedness and ill-posedness of the stationary Navier-Stokes equations in Triebel-Lizorkin spaces", The 15th Japanese-German International Workshop on Mathematical Fluid Dynamics, Waseda University, January, 2018.

・"Solutions of the stationary Navier-Stokes equations in homogeneous Besov and Triebel-Lizorkin spaces", RIMS 共同研究(公開型)『関数空間の深化とその周辺』, Kyoto University, February, 2018.

・"Solutions of the stationary Navier-Stokes equations in homogeneous Besov and Triebel-Lizorkin spaces", 『若手のための偏微分方程式と数学解析』, Fukuoka University, February, 2018.

・" Well-posedness and ill-posedness of the stationary Navier-Stokes equations in Besov spaces", Japanese-Indonesian International Workshop on Mathematical Fluid Dynamics, Waseda University, March, 2018.

・"Solutions of the stationary Navier–Stokes equations in homogeneous Triebel–Lizorkin spaces" and "Ill-posedness of the stationary Navier–Stokes equations in homogeneous Besov spaces", 日本数学会 2018 年度年会, Tokyo University, March, 2018.

・"Counter examples of the bilinear estimates of the H¥"older type inequality in homogeneous Besov spaces" and "Ill-posedness of the stationary Navier-Stokes equations in scaling invariant homogeneous Besov spaces", 日本数学会 2018 年度秋季総合分科会, Okayama University, September, 2018.

III. Research Results in 1st year

We consider the stationary Navier-Stokes equations in the scaling invariant Besov spaces. Recently, It was proved that for every small external force in $\dot{B}_{p,q}^{-3+n/p}$, there exists a unique solution in $\dot{B}_{p,q}^{-1+n/p}$, provided $1 \le p \le n$ and $1 \le q \le \infty$. It is also known that such solutions continuously depend on external forces in each topology. In this study, we show that if $p = n$ and $2 < q \le \infty$, or $n < p \le \infty$ and $1 \le q \le \infty$, then such continuity does not necessarily hold.

IV. Research Plan for 2nd year

We will apply the above ill-posedness problem to other stationary equations. Also, we investigate papers on the dissipative weak solutions (Onsager's conjecture), and consider its application.