Hence, by comparing with (5.53), we see that indeed

$$-\partial_i p + \mu \partial_k \partial_k u_i = -\partial_i p + \mu \partial_k \partial_k J_{ij} F_j = 0. \tag{5.57}$$

The difference between 3D and 2D hydrodynamics has been confirmed experimentally for *Chlamydomonas* algae [GJG10, DGM$^+$10].