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Interactive comment on "Manufactured solutions and the numerical verification of isothermal, nonlinear, three-dimensional Stokes ice-sheet models" *by* W. Leng et al.

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We extruded the analytical solution for the 2D Stokes ice-sheet models proposed by Sargent and Fastook (2010) to a third dimension to test our parallel FEM 3D Stoke ice-sheet model in our JGR (2012) paper, not in this paper. At that time (more than one year ago), we did not figure out how to correctly solve the whole equation (26) (the equation (32) is only part of (26)) and of course had no way to construct a truly 3D specific solution under the given special geometry.

In this paper we follow the idea of Sargent and Fastook (2010) on the construction of analytic solutions for the 3D Stokes ice-sheet Models. They did an excellent job and we

think their method is a very nice approach. So the framework and derivations in many places are similar in both papers. On the other hand, we think solving correctly the equation (26) is a quite essential (also nontrivial by any means) step in finding of the general form for the 3D analytic solutions. With a wrong formula of the general analytic solution, it is surely not just a problem of recalculation of the compensatory terms. The consequently constructed specific solution in Sargent and Fastook 2010 is also wrong and could not be used.

Our main goal is to present the ice-sheet modeling community a correct and practically useful sample solution to verify the computational 3D Stokes ice-sheet models. We first obtain the general form of the analytic solutions (correcting Sargent and Fastook's mistakes in solving the equation (26)) and then present a useful specific solution under a special 3D geometry, with further numerical verification of its validity by our computational FEM model (JGR 2012). We also would like to point out that the values of the parameters chosen for constructing their specific solution in Sargent and Fastook 2010 are much less suitable for the correct analytic solution case since those values will produce a complicated specific solution and very tedious compensatory terms. We figure out a new set of parameter values in this paper that give a relatively simpler specific solution and compensatory terms.

Interactive comment on The Cryosphere Discuss., 6, 2689, 2012.