Dear Perry and co-authors,

I (still) regret to say that your mass conservation given by Eq.(4) in your paper is not correct.

Let us use your notation. You must consider the relative velocities \( V_r = V - \dot{S}_\Omega \) when writing mass continuity in a control volume moving at speed \( \dot{S}_\Omega \) (your sketch drawn in figure 1):

\[
\rho_\phi h_\phi V_r = \rho_\Omega h_\Omega V_r, \quad (1)
\]

It follows:

\[
\rho_\phi h_\phi (V_\phi - \dot{S}_\Omega) = \rho_\Omega h_\Omega (V_\Omega - \dot{S}_\Omega), \quad (2)
\]

Because the material between the wall and the discontinuity traveling at speed \( \dot{S}_\Omega \) is at rest (in the domain \( \Omega \)), we have \( V_\Omega = 0 \). This then gives:

\[
\rho_\phi h_\phi (V_\phi - \dot{S}_\Omega) = -\rho_\Omega h_\Omega \dot{S}_\Omega, \quad (3)
\]

and:

\[
\rho_\phi h_\phi V_\phi = -\rho_\Omega h_\Omega \dot{S}_\Omega + \rho_\phi h_\phi \dot{S}_\Omega \quad (4)
\]

The equation above corresponds to the correct mass conservation, and yields:

\[
\dot{S}_\Omega = \frac{-V_\phi}{\frac{\rho_\Omega h_\Omega}{\rho_\phi h_\phi} - 1}. \quad (5)
\]

(By the way, note that your velocities \( \dot{S}_\Omega \) and \( V_\phi \), as defined in figure 1, are of opposite sign)

The calculations above (for \( h_\Omega/h_\phi > 1 \)) also work for the case \( h_\Omega = h_\phi \) if you would like to describe compaction against the wall without flow expansion upward (\( h_\Omega = h_\phi \) could be a reasonable assumption at the impact with the wall. However, after the initial impact of the snow avalanche with the wall this looks very unlikely to me).

Your Eq.(4) is wrong: it has to be corrected.

Regards,
Thierry FAUG