The topology of the footprints of wall-turbulence JASON MONTY,
University of Melbourne, MIN CHONG, IVAN MARUSIC, The University of Mel-
bourne — When studying the topology of turbulent flows, the three invariants of the
velocity gradient tensor are often used. For incompressible flow the first invariant
P is zero and the topology of the flow structures can be investigated in terms of the
second and third invariants, Q and R respectively. For example, isosurfaces of Q
above a certain threshold are often used in an attempt to identify vortical structures
in the flow. In wall-turbulence, however, these invariants are zero on a no slip wall.
Therefore, analysis tools relying on these invariants cannot be used to topologically
study the footprint of turbulence on the wall. In this paper, it is proposed that the
"flow" field on a wall can be described by a no slip Taylor-series expansion. This
provides a new tensor relating skin friction to streamwise and spanwise coordinate.
Like the velocity gradient tensor, it is possible to define invariants $\mathcal{P}$, $\mathcal{Q}$ and $\mathcal{R}$ of the
so-called "no slip" tensor. It will also be shown that it may be possible to investigate
the topology of the flow field on a no slip wall in terms of these invariants.

Jason Monty
University of Melbourne

Date submitted: 12 Aug 2011

Electronic form version 1.4