Seismic velocities derived from stacking of marine reflection data can provide clues to possible rock lithologies that are important for assessment of petroleum prospectivity of a basin, despite controversies in estimation of compaction-related and true lithology variation-related effects on seismic velocities, particularly in the offshore environment.

Interval velocities (Vint) used in this study were calculated from root mean square velocities (Vrms), heavily smoothed to suppress short period spatial variations, and then co-analysed with reflection seismic images. Careful velocity analysis based on coherency evaluation was employed to select certain locations within seismic profiles where velocities are reliably constrained within 3% deviation from the preferred value all the way down to required depth. Only velocities from these locations were used to support lithology interpretations.

Vrms velocities used were derived from long offset marine seismic data; they were picked on traces after pre-stack time migration and the 4th order normal move-out (NMO) correction implementation. Various distortions to interval velocities are therefore assumed to be largely suppressed.

Comparative analysis of Vint patterns between areas of significantly different water depth required adjustment of velocities to the sea floor. There are a number of methods for such adjustment, including presentation of velocities at each location as a function of pressure, rather than two way time, or depth. We discuss advantages and disadvantages of these methods and present examples from the Australian SW Margin including the enigmatic Wallaby Plateau, and the North Perth Basin, where we were able to calibrate our results against well logs.