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***Interactive comment on “Effects of increased  $p\text{CO}_2$  and geographic origin on purple sea urchin (*Strongylocentrotus purpuratus*) calcite elemental composition” by M. LaVigne et al.***

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The work by LaVigne et al is a very interesting approach to investigate the mineralogy of the sea urchin skeleton along a gradient of increased  $p\text{CO}_2$  along the coast of California. The title indicates the manuscript it about  $p\text{CO}_2$  effects – but in fact this this work is more a straight forward study of skeletal mineralogy. Thus I suggest a change to the title to better reflect the content, I suggest something like The mineralogy of the skeleton of Sp from populations along the California upwelling/ $p\text{CO}_2$  gradient and potential effects of increased  $p\text{CO}_2$  on mineral composition of the adult and juvenile skeleton. The mineralogy in itself is very nice and important data – so it will be better

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to highlight the strengths of the study – not the marginal data. The results with respect to the influence of pCO<sub>2</sub> are equivocal for two reasons – 1. Strong biological control of mineralization in sea urchins 2. Low sample size of the laboratory studies Thus I suggest that many statements need more balance due to low power of the analyses – for instance p. 17955 – the data do not really ‘demonstrate’ the role of elevated CO<sub>2</sub>. .... Specific comments What is the carbonate chemistry along the gradient? For instance does the local water vary in Sr. Were the progeny of each population exposed to local water? It would be good to know the elemental composition and saturation states of water from the different sites. I think some of this information is available in the Hofmann monitoring data? An n=2-4 is very low. In the methods explain what the replication of each measurement was so that we can understand the level of replication for each ANOVA. The ANOVA would had an unbalanced design and this needs to be explained. On p. 17950 first para – move info to the methods stating which samples were too small for analysis. The 5 juveniles that were reared for 5.5 mo – where they put back in control conditions or maintained in the experimental conditions? I presume they were fed – need details. I wonder about the citations of the Ries paper – on page 17943 a big change in skeleton mineral content is quoted – but on p. 17954 – the lack of change in the present study is said to be consistent with lack of response to OA by Atlantic urchins. This is a bit confusing. What did Ries attribute the big (30%) change to? Differences in calcification rates is suggested to be a potential rational of the slight difference in the mineral content. Please explain what is meant by rate. Is this growth of the skeleton? For instance knowing from the Yu et al. papers that Sp larvae from the region as this study grown in high CO<sub>2</sub> are smaller – does this mean that smaller (but same age) larvae that are growing more slowly have a different skeletal mineralogy? p. 17944 – the differences among studies are also due to different methods see Byrne 2012 – Mar Environmental Research What would an 8% increase in Sr mean for the larvae?

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