The topic of this manuscript is very interesting and I am personally very curious about this topic. The results look reasonable. I enjoyed reading the manuscript.

The idea of the analysis is nice and the figures are very clear and easy to understand.

I have some comments and questions.

Major comments:

0. First, a common index for subtropical high is omega at 700hPa? I imagined the most common index is the sea surface pressure (SLP).

1. The title says "Factors Causing Stratocumulus to Deviate from Subtropical High Variability". So I imagined the ultimate target is the relationship between the low cloud fraction and SLP. If so, I wanted to see the relationship between them for the seasonal and interannual time scales first. In addition, I guess this relationship (low cloud fraction and SLP) can be decomposed into the following relationships.

(A) the low cloud fraction and EIS.	x	(for seasonal and interannual)
(B) EIS and θ700	o	
(C) θ700 and Q (defined by eq. (5))	o	
(D) Q and ω700	o	
(E) ω700 and SLP	x	
(F) EIS and θ1000	o	
(G) θ1000 and ocean upwelling	x	
(H) θ1000 and latent heat flux	x	
(I) ocean upwelling and gradient of SLP	o	
(J) latent heat flux and gradient of SLP	o	
(K) a gradient of SLP and SLP itself	x	

The authors showed the important essential relationships among them (Relationships marked by "o" are (at least partially) shown. Relationships marked by "x" are not

shown.). However, could the authors schematically describe in the text which relation is discussed in the present paper (because it is a bit hard to catch what is discussed and what is not discussed in the manuscript.)? The relationships that are not shown could also be helpful for the readers. Could the authors add such figures (at least (A) for seasonal and interannual, and (E).) in supplemental materials? I also want to know the correlation between EIS and omega700 (that is not shown in Table 1).

1'. (Related to item 1.) Could the authors clarify the reason why θ1000 are not examined at the beginning of the analysis in the text more explicitly if the authors don't do them? Is this because "Environmental changes associated with variations in the strength of the subtropical high pressure regions correlate better with LTS (and EIS) than they do with the components of the LTS and EIS the variations are thought to influence (L240-241)"?

Minor comments:

L1-2: "Stratocumulus (Sc) covers the eastern flanks of maritime subtropical high pressure systems and exerts an influence on the global energy budget comparable to CO2."
This sentence seems to be unclear. Do the authors mean the total CO2 radiative effect (difference between the current CO2 concentration level and zero CO2)? Or the change of (doubling) CO2 (~4 W/m2)? The influence of Sc is (the global average of) cloud radiative effect of Sc itself (difference between the current Sc existence and clear state. not change in CRE of Sc)?

L4: "gradient"
"difference" is better?

L39-41: "The first hypothesized mechanism would be that variations in the strength of the high influence the free-tropospheric temperature above cloud top through enhanced adiabatic warming. This mechanism follows the pioneering work of Rodwell and Hoskins (2001), who demonstrate how monsoons can influence the strength of the high to their west"
The first sentence mentions the influence of high-pressure systems on clouds (the cause is the variation in high-pressure systems and the effect is the variation in clouds). The second sentence seems to discuss the influence of the

monsoons on the variation of high-pressure systems (the cause is the monsoon variations and the effect is the variations of high-pressure systems.). Are the mechanisms similar?

L157-164 (2nd paragraph of 3.1):

I thought the essence of these characteristics was discussed in Klein & Hartmann (1993). So it's appropriate to cite the publication here.

L168: "or aloft, driven by downwelling"

What is "downwelling"? Air (atmospheric) subsidence? Or ocean downwelling? Could you please clarify what downwelling or upwelling you mean when you use these terms?

L169-171:

"For the seasonal cycle, the three regions with the largest variability of the strength of the high (measured by the standard variation of ω700,H in Table 1) are also the regions where θ700 varies more than θ1000. However, this correlation does not imply causation, as the interannual series fails to exhibit the same relationship."

Especially mid-latitude (including subtropics), the seasonal cycle of θ700 is mainly controlled by the seasonal cycle of solar zenith angle (not by omega700), I thought. I guess people generally imagine that ω700 cannot determine θ700 (at least) except tropics. Am I wrong?

L177-179:

"The somewhat weaker relationship between EIS and LHF can be expected because while surface winds cool the surface, and hence lower θ1000, increased latent heat fluxes also breakup the cloud decks"

This sentence discusses the relationship between EIS and LHF. So the fact that increased latent heat fluxes break up the cloud decks cannot be the reason for the relationship between EIS and LHF (i.e., cloud cover doesn't affect EIS directly), I guess.

L184: "atmospheric downwelling"

Does this mean the air (atmospheric) subsidence?

Captions of Figure 3 and 6:

Plotted variables look not raw values but anomalies of the variables. In addition, I couldn't find the meaning of the apostrophe attached to the variables.

L230: "cloud-top temperature"

L232: cloud-top

Generally, 700 hPa is not cloud top but above stratocumulus and in the free atmosphere, I guess.

L242: "upwelling velocity"

Can you clarify what upwelling this is? Ocean upwelling velocity?