The authors apply a solitary wave model to numerous sporadic Na layer (Na_s) profiles measured with a lidar at the Andes Lidar Observatory and find that for most events, a solitary wave model provides very good fits to the Na_s profiles. The implication is that these Na_s are linked to and may be somehow caused by the solitary wave. The paper is adequately referenced but I found the writing quite confusing in places. Section 2, where the fundamental solitary wave theory is discussed needs a major rewrite as do Section 3.1, 3.2 and 3.3 where the fitting of the theory to data is discussed. I understand what they are doing, but it was figure 2, not the text that enabled me to figure things out. Even so I'm puzzled by some of the equations, for example, should equation (11) be written as

$$u(x,t) = u_2 + (u_1 - u_2)sech^2\left[\sqrt{\frac{u_1-u_2}{12\beta}}(x-ct)\right] ?$$

Although the idea that Na_s may be related to solitary waves is interesting, my main concern is that the authors have provided no insight into how the Na density could rise to such large values in Na_s simply by the passage of a solitary wave through the Na layer. The conventional explanation for Na_s is that very high concentrations Na^+ are collected in thin layers by the combined effects of the earth's magnetic field and the vertical wind shears caused by large amplitude waves and tides. Chemical reactions then convert the Na ions to neutral Na, thus forming the Na_s. While the authors have demonstrated that the solitary wave model provides a good fit to the Na_s, this is hardly evidence that solitary waves are involved. Na_s are thin, sometimes form rapidly, and often show vertical phase progression that mimic the phase progression of long period waves and tides. The authors do not discuss those issues. At a minimum, they need to show how a solitary wave propagating through the mesopause region would impact the density profile of minor species like Na. Such theoretical work has been done for waves and tides (e.g. Gardner & Shelton, JGR, 90(A2), pp. 1745-1754, 1985), but not for solitary waves, which behave differently.

I recommend that the paper be returned to the authors for major revisions, that address the issues I have raised. I hope they do so because if they can show how a solitary wave produces the thin Na_s with vertical phase progression, like that illustrated in Figure 3a, then this would provide convincing evidence that solitary waves are frequent in the mesopause region and deserve more attention from the upper atmosphere research community.