

Answer to W. Zhou's suggestion:

W. Zhou: The authors present an interesting analysis of noontime peak SO₂ in the northern China plain. The authors are suggested to discuss if SO₂ was consumed by lower clouds via aqueous processing when SO₂ peaks occurred. Previously, SO₂ in Texas power plant plumes was rapidly lost via aqueous processing of scatters clouds, the corresponding SO₂ lifetime of which was 2~3 hours (Zhou et al., 2012).

Thank you very much for this valuable comment. We are aware that the aqueous chemistry in lower clouds can lead to rapid loss of SO₂ within the boundary layer. In Sect. 3.3 of our paper, we already have some discussions on the impact of heterogeneous chemistry on SO₂ scavenging. Since past studies have not shown clear diurnal variations in cloud coverage or cloud liquid water content (LWC), we assumed a constant LWC throughout the day. A more detailed study on SO₂-cloud interaction will be shown in our future work. Again, we greatly appreciate your suggestion, which is very valuable for our future work.