

## ***Interactive comment on “Measuring FeO variation using astronomical spectroscopic observations” by Stefanie Unterguggenberger et al.***

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### General comments

The paper presents spectroscopic observations of FeO and Na nightglow emissions by the X-shooter instrument at the VLT / Paranal Observatory, Chile. The observations are analysed on diurnal as well as seasonal scales and compared to theoretical considerations. The seasonal variation of the emissions is very satisfactorily reproduced by an atmospheric chemistry model. This analysis reveals new insights about FeO in the MLT and the quantum yields of the relevant emissions.

The paper presents new data and insights which are relevant to the field and well suited for publication in ACP. The methods and assumptions are valid and clearly outlined. In general, the experiment and the calculations are sufficiently described. Some sugges-

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tions are given below to improve the description further. The authors give proper credit to related work and clearly indicate their own contribution. The overall presentation is well structured and clear. Some suggestions to improve the presentation further are given below. The title reflects the contents of the paper and the abstract provides a concise and complete summary.

I recommend publication of this interesting manuscript after minor revision and ask the authors to address the following comments and suggestions.

### Specific comments and suggestions

Page 2, line 24: Suggestion: change "source of THE metals" to simply "source of metals", "source of metal layers", "source of meteoric metals" or similar, as this is the first account of mentioning "the metals"

Page 3, line 12: It appears slightly odd to me to refer to sodium as "a good CANDIDATE" since observations of Na are well established and not only theoretically considered. Suggestion: "a good candidate" -> "well established", "commonly used", or similar

Page 5, line 16: Can you provide more information about the criteria of the "additional quality checks" applied to the data? Are these implemented in the pipeline (Modigliani et al., 2010) or are additional reductions performed, e.g., by discarding spectra with obvious distortions through technical problems?

Page 5, lines 19/20: "...an adapted version of pipeline v2.6.8 of the ESO public pipeline..." Suggestion: change to "...an adapted version of the public ESO pipeline v2.6.8..."

Page 5, line 28: I'm not familiar with the term "echelle orders". I suggest changing to "higher diffraction orders of the echelle spectrometer" if this is what is meant. Furthermore, can it be easily explained how the pipeline (i.e., data processing) introduces these as opposed to the instrument? It might be worthwhile adding a further short

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explanatory sentence, since this influence does not seem to have been covered in the cited literature.

Page 6, line 12: "FeO is only a faint pseudo continuum component": this doesn't really make sense to me. Suggestion: change to "FeO has only a faint pseudo continuum component" or "the component of FeO to the observed pseudo continuum is only faint" depending on what you want to say here.

Page 6, lines 23&24 and Figure 2: In the text you refer to the exposure time as "roughly 1 hour" and the resolving power as "\approx 7450". In the caption of Figure 2, however, the exposure time is given as precisely "3600 sec" and the resolving power as "7450" (without approx). Please clarify, e.g., by choosing either "roughly 1 hour" or "3600 sec", whichever is correct.

Page 7, line 2: Recommendation: change "this interval" to "the interval" as it is not referred to in the previous sentence.

Page 7, line 14: "which IS according to Gattinger et al. [2011] defined at" -> "which according to Gattinger et al. [2011] IS defined at" ?

Page 7, line 14: "FROM their selected wavelength range" -> "IN their selected wavelength range" ?

Page 7, lines 13/14: Here and throughout the manuscript there are several personal references to studies (i.e., "They found..." instead of "That study found..."). This very much is a stylistic choice of the authors, but I suggest to change those occurrences to the more neutral, impersonal form. In this example, I suggest changing "from their selected wavelength range" to "in the wavelength range of that study" or similar.

Page 7, line 15: I recommend placing "of 6%" between "an error" and "for the FeO main peak"

Page 8, line 24: While the observed FeO spectra indeed match the theoretical work of Gattinger et al. with "good overall agreement", I recommend to add a note that some

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parts show a difference in relative intensity of more than 50% (in particular at around 590 nm and 600 nm, well within the main peak).

Page 10, line 2/3: "...we obtain a value of 3.9%" ...of what? Do you mean to say "...we find that FeO contributes 3.9% to the overall spectrum." ?

Page 10, line 27: "...are the low statistic bins." Suggestion: change to "...have the lowest statistic." or "...contribute the fewest data points." or similar.

Page 11, line 6/7: "show A similar" or "show similar ... variationS" ?

Page 11, lines 11-15: This description is not very clear to me. If 2010 shows a different behaviour than 2011&2012, does this mean the effect in those years would be even stronger than in the combined data shown or was 2010 excluded from the plot? Similarly, were the data from September and November 2011 excluded for the reason given or does this imply that the data from these months decreases the effect shown?

Page 14, line 10: Suggestion: "...rates were using the..." -> "...rates were CALCULATED / ESTIMATED using the..."

Page 16, line 7: "The shape of the quintile spectra is almost identical." Identical to what or during which periods? I assume it is meant identical to each other.

Figure 3: Please use a lighter shade of grey for regions where the correction might not have been performed accurately. The contrast of the black and blue curves to the grey shaded areas is very low. It is furthermore slightly distracting to have features as prominent as the dark grey areas in the figure without a description in the figure or its caption.

#### Technical comments

Page 6, line 6: "and as well as": choose either "and" or "as well as"

Page 7, line 28: "are discussed" -> "is discussed" ?

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Page 8, line 6: "merge" -> "merged" or "merging"

Page 8, line 15: "normalize" -> "normalized"

Page 8, line 15&16: Throughout the manuscript, you seem to prefer British English over American English. While "normalized" is probably acceptable in BE, you might consider changing to "normalised" for consistency here.

Page 12, lines 4/5: "...between 0 and 0.65 x the maximum intensity" Change to "...between 0 and 0.65 OF the maximum intensity" or consider using percentages as done previously

Page 12, line 20: "...squareS the Bayesian..."

Some comma errors, e.g. Page 16, line 6: "...with intensity, median..." Page 16, line 12/13: "...pointed out that..."

Figure 4(d): "Okt" -> "Oct"

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