Review of 'Terrestrial kilometric radiation observed on pre-midnight side of the Earth at 1-2 L-Shell' by Boudjada for publication in the Journal Ann. Geophys..

The authors state that kilometric continuum (KC) is observed by the DEMETER spacecraft, which is at an altitude of ~700 km. The scatter plot in Figure 4 shows the bulk of the emissions occurring below 100 kHz. At 100 kHz the plasma density is ~120 cm^{-3}. Since KC is a free space mode radiation its frequency (f) must be above F_{PE} or F_R [eg. Shaw and Gurnett, 1980, Kennel et al., 1987]. I don't know the DEMETER location for Figure 1 so used 2 magnetic field strengths in the table below.

$N_E(cm^{-3})$	B(nT)	F_{PE} (kHz)	F_{CE} (kHz)	F_R (kHz)	F_L (kHz)
10000	30000	900	839	1413	573
1000	30000	284	839	927	87
100	30000	90	839	849	9
10000	20000	900	559	1222	662
1000	20000	284	559	679	119
100	20000	90	559	573	14
The cutoffs F_R is f where R=0, F_L is f where L=0; R&L are from Stix [1962] F_{PE} -plasma frequency, F_{CE} -electron cyclotron frequency.					

The authors suggest that the emissions observed by DEMETER could be related to plasmaspheric plumes. For one to believe these emissions observed by DEMETER are free-space KC, a plasmaspheric drainage plume/channel would have to extend down to ~700 km altitude with minimum densities of say ~ 100 cm^{-3} or less at that altitude; an altitude where ~ 10^4 to $4x10^4$ cm^{-3} is common near the equator. Looking at Figures 2 and 3 of Chen et al., [2018] N_E dropping below 10^4 cm^{-3} on the nightside or dayside around the equator is rare. So, if DEMETER is frequently seeing this emission around the equator then I don't believe these emissions are free-space.

Z-mode radiation occurs at f between F_L and F_{UHR} (upper hybrid resonance f) the authors need to check if this radiation could be Z-mode.

MAJOR COMMENT:

A key issue must be resolved, before the reviewer can accept this paper for publication.

Since this is a major claim that DEMETER detects KC, a detailed event analysis should be given in the paper that demonstrates the radiation is free space mode.

You have not convinced me that your type 1&2 events are free space radiation.

I suggest that you show one of more example spectrograms of events with the frequency of the &F_{PE}& &F_R& F_L & F_{CE} lines overlaid on the spectrogram. This will give the reader a feeling of whether or not the radiation is free-space.

If ISL Langmuir probe paper Lebreton et al. [Planetary and Space Science 54 (2006) 472–486] data is not available for any of your events, you could try IAP or infer the plasma density from the E/B ratio using data below 17.4 kHz, assuming you can identify the wave mode and the E&B measurements are reliable. 100 per cc might be the threshold of ISL so f(l=0) & fpe & fuhr would be a upper limit.

and

If you can correlate some of your events with KC events observed by GEOTAIL PWI. The GEOTIAL PWI 24 hr survey plots are located at http://space.rish.kyoto-u.ac.jp/gtlpwi/. I see no KC in the GEOTAIL PWI spectrograms for the 2 days given in your paper, of course GEOTAIL could be at the wrong LT or the KC generated at low RE does not always escape the plasmasphere/ionosphere.

On your spectrogram plot please indicate where the IGRF (or similar) model field aligned magnetic minimum crossing occurs. If centered about the Type 2 emissions then this would cast doubt in my opinion about the emissions being KC.

No discussion of the interpretation of the harmonics of type 2 is given. Looking at the type 2 in Figure 1, the spacing between the harmonics is ~25 kHz. Using a simple dipole and standard continuum emission model this places the equatorial source at about ~3.2 RE, with a sharp plasma gradient, with Ne extending up to at least (fpe=600 kHz) ~4500 cm^{-3} at that location. Fpe at 600 kHz at ~3.2 RE is at the upper range of observed plasmaspheric plasma frequencies at ~3.2 RE, further casting doubt in my opinion. It is not clear to me if harmonic spacing of ~25 kHz can be explained in terms of local plasma conditions and/or non-linear processes.

Because F_{CE} is large I would like to see at least one the spectrogram of the entire ICE frequency range out to 3.25 Mega-Hz.

Have you to tried to correlate Type 2 with the particle measurements (IAP, ISL, IDP)?

It's important to understand these emissions. Have you searched for other explanations for these emissions? Could this be an example of instrumental spherical probe pre-amp oscillations due to localize plasma conditions?

OTHER COMMENTS:

Free-space or Z-mode emission in an equatorial plasma bubbles might be another possibility instead of drainage plumes. Equatorial bubbles are observed by DMSP on about 1 out 8 orbits [Huang et al., JGR 2001] whether the internal density of bubbles can be low enough to accommodate the DEMETER observations is not clear.

Line 28. 'We use a manually technique which consists to follow and to save with the PC-computer mouse'. Instead of manual selection did you try an automated selection method. Looking at Figure 1, it seems like automated selection followed by visual inspection of those selections might save one time, this would allow you to scan a larger time interval.

You don't give enough information about your survey.
Start/stop dates that your survey covered.
We looked a X nightside equatorial crossings finding Y events?
We looked a X dayside equatorial crossings finding Y events?
Where these emissions not observed before 2010? If so why, or did you not look before 2010?

Figure 1 is not of publication quality. I would also include a dayside example, maybe 2 dayside and 2 nightside examples, with better annotation as described earlier in the review.

Figure 2
Lack of clarity in how the histogram is computed: for example, looking at Figure 1 at 14:01:40 are all harmonics summed in a given latitude bin?
I would make a weighted histogram instead, summing the weights in each latitude bin. For example if you selected 800 points in Figure 1, then I would weight each selection by 1/800 for that equatorial crossing.

Why not split histogram into day/night?

Scatter plot of power versus frequency might be revealing.

An annotated spectrum at the center of Type 2 would also be helpful.

power level (defined as square root of the power spectral density)

Figure 3: include legend of what the 3 colors correspond too, don't just say it in the text, this makes it hard for the reader.

Figure 4: include legend of what the 3 colors correspond, don't just say it in the text. Why not split into day/night?

A scatter plot for Type 2 of the frequency spacing of harmonics versus frequency of harmonic might be revealing. From standard theory this can be used to estimate the fc/fp ratio at the source under the assumption that the density gradients are sharp.

References

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