Dear Members of the Kollegium, dear Referees,

we are thankful for a detailed assessment of our pre-proposal, which have helped us reformulate our concept for a Research Unit in a more coherent and detailed way.

The description of the project has been significantly improved as a result of the comments provided by the referees, small changes to the team structure and to the requested support have also been applied.

These are all listed below, together with detailed answers to all points raised by the three referees and by the Fachkollegium.

We hope that you may reconsider our application for a Research Unit, based on the new material we submit.

Sincerely,

Barbara Ercolano on behalf of the Research Unit team.

Main Changes

1) Main structural changes to the Research Unit

Since the submission of the first version of the pre-proposal, the LMU has given full commitment to this project by awarding the speaker Barbara Ercolano 50,000 Euro plus a reduction of her teaching duties for a semester (equivalent to 35,000 Euro to hire a substitute) to support preliminary work for this proposal. The funds came from the LMUexcellent initiative.
Dr Giovanni Picogna has been hired for 10 months, and has started on April 1st 2016 working on the tasks that were planned for PhD1 of sub-project B1. An extra 10 months will be awarded by the LMU to bridge the gap between January 31st 2017 (the end of the LMUexcellent award) and a potential start of the Research Group first funding period. Dr Picogna has then potentially 20 months to complete most of the tasks of the project planned for PhD1 of sub-project B1, which should be enough, given that he is an experienced numericist and is able to work much more quickly and efficiently than a starting PhD student would have.
For that reason we now ask for funding for 1 Postdoc (instead of 2 PhD students) for project B1, to extend Dr. Picogna's contract. Dr Picogna will then be responsible for all tasks in sub-project B1.

In agreement with the referee's suggestions we have made the following further changes:
1 PhD student instead of a Postdoc for project A2
1 Postdoc instead of a PhD student for project B2

1 PhD student instead of 2 PhD students for project C1
1 Postdoc instead of 2 PhD students for project D1

We now have an equal number of Postdocs and PhD students, however the budget has not significantly changed.

1) Changes to the team
In line with some of the referee's comments our team has expanded to include Prof Thomas Henning (MPIA, Heidelberg) and Prof Ewine van Dishoeck (Leiden University/ MPE Garching) who have agreed to be external collaborators of the proposed Research Unit. While they will not receive any funding specifically, since they are not PIs on any projects, they will collaborate and provide access to the latest data collected with ALMA and VLT/SPHERE for the observational consortia they are members of.

2) Main changes to the text
The Introduction and the description of the individual projects has been thoroughly re-written to add clarity and in response to the questions and comments raised by the three detailed referee reports, in particular in response to the concerns of the Fachkollegium. The specific changes are highlighted in the detailed response to the referee below.

One of the main changes to the text in the proposal is a more detailed Introduction that better focuses the aims of the proposed project and demonstrates more clearly how all the proposed tasks are directly connected to understanding transition discs (TDs) and at tackling the posed astrophysical questions.

We report here only a summary of one of the important basic concepts that was perhaps not stated explicitly enough in the previous version and it is crucial to keep in mind as a context to the answers to the individual concerns of the referees, in particular with regards of the relevance of the individual tasks to the topic of Transition Discs.

As discussed in more detail in the introduction of the revised version of this proposal, TDs are a very diverse class of objects. Amongst the TD zoo, however, at least two separate classes seem to have emerged, which we call Type 1 and Type 2 in this proposal. Type 1: TDs with low/no accretion rates and small (few AU) inner disc radii. Type 2: TDs with high accretion rates (~10^-8 Msun/yr), not too dissimilar from the accretion rates measured on primordial discs. Type 2 TDs also tend to have larger inner disc radii (few tens of AU) than type 1 discs and much higher mm flux levels. Owen & Clarke (2012) showed that it is statistically unlikely that the two groups may be drawn from the same underlying population. When talking about TD demographics it is then important to draw the distinction between the two types, as the dominant formation mechanism may be different.

About a half of the global transition disc population consists of Type 1 discs. These discs are probable candidates for a formation route dominated by disc clearing via photoevaporation processes. Type 2 TDs are more likely formed by giant planet(s) formation. The above statements are obviously rather simplistic, as other processes (e.g. dust evolution, chemistry) are also likely to simultaneously play a part in both cases. The division in the two classes is however useful for clarity of discussion.

Both types of TDs inform us about the planet formation process. An extremely simple view could be:

Type 1 TDs (probably formed by photoevaporation) are relevant to planet formation as hinted to by the fact that the timescales of disc dispersal and those of planet formation are similar. This means that planet formation occurs in discs that are on the verge of being dispersed. The dispersal mechanism hence determines the physical conditions in the disc at the time of planet formation.

Type 2 TDs (formed by the interaction with giant planet(s)) are the direct witnesses of the planet formation process in act.

Detailed answers to the referee reports

In what follows, we provide comments and answers to the questions raised by the referees in the following order: We first answer those questions that were specifically highlighted by the Fachkollegium, we then answer each question from each of the three referee in the order they were listed and point to the changes in the revised version of the proposal.

1) General comment from Referee 1:
(Referring to the Future Perspectives) "The longer term outcome was not well described. The future perspective section mentioned population synthesis models, but there are many aspects of such models that are not considered in this proposal (e.g. dynamical interactions between multiple planets or planets and discs, pebble accretion)."

We have been unclear in this section as to what types of population synthesis models we aim at building in the second funding period. We did mention that we aim at tackling the fundamental question of demographics of transition discs. But we also mentioned planet formation models, which was indeed confusing. The processes mentioned by the referee are all very important and need to be included if one aims at building population synthesis models of planet formation itself. Instead we aim at building population synthesis of transition discs, which may help to shed light and constrain several related aspects of the planet formation process.

In the second funding period we will have all the tools to exploit transition disc observations and through these learn about the planet formation process. We foresee a two-pronged approach in Phase 2:

A) Detailed modelling of individual objects.

This will follow mainly from the joint work of areas A (in particular A1) and D, and will target mainly Type 2 TDs. The insights gained in Phase 1 of the Research Unit will allow us to construct tailored models of planet-disc interactions to explain specific observations of Type 2 TDs (not necessarily obtained by our group). The tailored models will allow us to decode the message in the many interesting new features highlighted already by spatially resolved observation, which by the beginning of the second funding period will have surely delivered more surprises.

B) Statistical distributions/demographics of Type 1 TDs.
The work carried out in Phase 1 in areas A B and C will have resulted in the most advanced disc dispersal models, which would have also been calibrated for important quantities with direct observations. We will use these models to construct population synthesis of Type 1 transition disc demographics (e.g. inner hole radius vs accretion rate), to compare with available surveys in individual clusters.
This will be a very strict, direct test of our disc models, and will allow us to predict realistic initial conditions in the disc at the time of planet formation and migration, which are fundamental inputs for planet formation models (that are however beyond the scope of this proposal).

We have rewritten this part in the new proposal to mirror the discussion above.

2) General comment from Referee 1:
(Also referring to the Future perspectives) "Applications to the Solar System and to the formation of planetary systems able to host life were also rather tenuous."

We agree that we did not provide detailed information apart from a simple statement about the relevance of our models to Solar-Nebula-type models. It is difficult to foresee exactly the program of a potential Phase 2. As well as depending on the outcome of our Phase 1 project, the exact focus of a potential extension would depend on the developments of the field as a whole. We were trying to just provide ideas of how our models may be further developed and applied in the future. We have included an amended statement in the new proposal to this effect.

3) General comment from Referee 2
"The questions posed in the Scientific Objectives sections are in a general sense "The right questions" to ask. Whether this programme will provide definite answers to those questions, in terms of high impact, world leading results is less clear"

As no further explanation was provided for the doubts expressed by the referee at this point of an otherwise rather encouraging report, we assume that these have arisen because of the comments that this referee expressed to the individual sub-project (which will be discussed later) or in the following comments in the overall summary:

"I was surprised by the ratio of postdocs to postgraduate students. This is a competitive field and to be leading this research must be conducted in a timely manner, and it is not clear at all to me that

giving complex projects involving simulations or observational data analysis. Surely a more experienced postdoc would be able to push this programme forward more effectively?"

There are indeed limitations in the funding scheme as the referee recognises and the Kollegium also states in their comments, by which one can't just increase the quota of postdocs unlimitedly. However we feel that many of the goals stated are well within the reach of PhD students if well supervised. All PI members of the Research Unit have committed a significant percentage of their research time to this project and the PhD student will benefit from close supervision, as well as the possibility of interacting with pears. We have however taken the referee's concerns in consideration and made changes in the resources requested for the individual projects, which were summarised above. We now ask for an equal number of PhD and Postdoc positions.

"I also felt that some of the ideas presented (particularly "run hydrodynamics models followed by Rad-MC") didn't sell themselves as internationally leading".

We are not sure as to what particular project this comment is referring to in particular, however we have re-written the description of all sub-projects to better highlight the competitiveness of our program. Indeed some of the projects require hydrodynamic simulations and the only way to compare results from hydrodynamic simulations to observations is via radiative transfer post-processing (e.g. Rad-MC). However, none of our projects are limited to just that. Furthermore projects C1 and D2 now include also new ideas about the formation of Type 2 TDs that have emerged in the last few months, which we wish to test with our new models. We hope that the new description makes clearer that this all goes well beyond just running hydrodynamics models followed by Rad-MC.

Unfortunately there is not enough information in the Overall summary or by the statement about impact (answer to question g) to specifically address the source of doubts from the referee, who otherwises rates our proposal good, our team strong and our goals worthwhile in an important area. We then hope that by answering the specific comments of this referee about the individual project (see below) we may resolve her/his doubts about the impact of our proposed research, which seems to have raised bells by the Kollegium.

4) General comment from Referee 3:
This referee comments that some of the tasks proposed have little to do with Transition Discs. This leads the Kollegium to doubt the coherency of the programme.

We have restructured our proposal both in the introduction and in the individual tasks so that the connection of all the projects to understanding the origin and the appearance of transition discs should now be evident. Detailed answers to the individual comments to the sub-projects will be provided below.

5) General comment from Referee 1:

The Kollegium mentions that this referee describes the program as "relatively coherent, although I felt that some areas were better connected than others".

We agree that the sub-projects B1, C2, B2 are more dependent on each other, in the sense that the output form one will directly feed in the other. However all sup-projects in the proposals are connected to answer the question of how are transition discs formed, why do they look the way they do and, most importantly, what can they tell us about planet formation. This is further re-iterated in the new proposal. Furthermore the direct links across the areas and individual sub-project are explicitly mentioned in the research area summaries as well as in the individual sub-project descriptions.

6 General comment from Referee 1:
The Kollegium mentions that the benefit of a collaboration is not always obvious for referee 1.

However the referee answer to question (c) is positive. She/he mentions that " The benefit of the collaboration is the ability to develop or provide input to more complex models, and in so doing work toward solving a problem at the forefront of current astrophysics." She/He also mentions that there are some risks in the proposal (which we address specifically later), but also adds that these risks " do not preclude it being a good idea to improve the models and work toward these goals". She/He also praises the structure of our RU (see her/his answer to question c) .

In what follows we now answer the remaining points in order they were raised by the 3 referees:

REFEREE 1

General Comments
1.1) "The connection between some of the projects was less clear than others"
As mentioned above, the connection between the various project has been further stated and the added benefit of the RU more explicitly described. See also answer to General comment 5.

1.2) "Lack of expertise in scattered light observations"
As mentioned above we have now enlarged our team including Prof. Thomas Henning (MPIA Heidelberg) as external collaborator. Furthermore Prof Dullemond has now been included as external collaborator in the SPHERE disc consortium.

1.3) ALMA observations of gas are not mentioned although these have been included in recent work and the team are also involved in that.
We have also added Prof. van Dishoeck to our team as external collaborator. Line observations amongst other, are essential for the dynamics. Words to that effect have been included in project B1 and D2. While this is of course a very important aspect, we do not expect to carry out all observations in-house, indeed we rely on collaborations, which are now more clearly mentioned in the text.

1.4) "Resources needs were not always well justified. "
We have addressed this in the general section above and in the new proposal the resources requested, where needed, are justified in the text of the individual sub-projects. Note however the restrictive page limit for the sub-projects description at this pre-proposal stage. In general we have followed the referees suggestions and made changes to the resource requirements as summarised above.

1.5) "Long term goals description insufficient"
See answer above to General comment 1.

Comments to the sub-projects (Referee.Subproject.Comment)

1.A1.1) Role of the Phd in the projects where datasets are PIed by others.
In the reworked version of this sub-project we have now added concrete examples of PhD students who led or are leading specific areas in the collaborations. Experience shows that in these collaborations we are responsible for the analysis of the dust properties via multi-wavelength continuum analysis and of the combination of millimetre and optical data.

1.A1.2) How are the tools developed by Tazzari linked to those used elsewhere in the project
The tool developed by Tazzari is specific to analyse (mm) interferometric observations of discs with the goal of deriving disc structural and physical parameters. Mainly the surface density distribution of discs (i.e. how the mass is distributed with radius) and the dust properties as a function of the location in the disc (to analyse the grain growth properties across the disc). We hope that this is now clearer in the new version of the proposal.

1.A2.1) How can we distinguish between the two interpretations?
We have substantially modified the text in sub-project A2 adding also a third theory that we will be able to test with our data. We summarise the differences between the three theories here but point to the new text for a more detailed description of the theories themselves.

Theory 1
The earlier theories trying to explain how accretion somehow may reduce the X-ray emission, could not make testable predictions.
The proposed effects (like changes in the coronal magnetic field structure by the accreted material, stripping of the coronal magnetic field by the interaction with the disc, or a reduced differential rotation in the star due to magnetospheric coupling) would depend very sensitively on the details of the interaction. The resulting reduction of the X-ray luminosities could be quite strong, but also rather weak, and should thus essentially introduce scatter in the relations between the X-ray properties and accretion properties.

Theory 2

The Drake, Ercolano, et al. (2009) model which claims that coronal X-rays disrupt accretion, via lowering the surface densities in the disc and establishing a ‘photoevaporation-starved-accretion’ phase , however, makes a rather clear prediction that the accretion rate should scale inversely with the X-ray luminosity.

Theory 3

Theory 2 rests on the assumption that the photoevaporation-starved-accretion phase lasts long enough to be detectable. This is however questionable, and more recently Ercolano et al. (2014), proposed an alternative model still. They suggest that the photoevaporation-starved accretion period is too short to be detected and instead what is most likely detected is the lowest possible accretion value that a given disc achieved before the formation of a Type 1 TD. Indeed viscous theory predicts a power law evolution with time of the accretion rates, meaning that discs spend most of their lives at the lowest possible accretion rate, which muss then roughly equal the wind rate. On this model one expects that the observed accretion rates should be directly proportional to the X-ray luminosity, since the latter are directly proportional to the wind rates (Owen, Ercolano et al. 2010, 2011, 2012).

This direct relation between accretion and X-ray luminosity can be tested with the observational data. In summary, the different outcomes with allow us to draw the following conclusions:

1) Large scatter when relating accretion rates and X-ray luminosities would point to Theory 1

2) Inverse linear relation between accretion rates and X-ray luminosities would point to Theory 2

3) Direct linear relation between accretion rates and X-ray luminosities would point to Theory 3

We have modified the text for this sub-project to make the above clearer.

1.A2.2) Is this project substantial enough to require a Postdoc?

We have reworked the description of this project, recasting the main aims and methods, so that it is now suitable for a PhD thesis.

1.B1.1) Risky project because uncertainty of existence of observable wind tracers and the dependance on other projects

We have restructured the project description to contain the following risk assessment:

"As it is currently unknown which diagnostic may directly be related to wind rates and profiles, this is potentially a high risk project. However we have hints from MIR observations that such diagnostics exist, and our approach is unique in finding them. This is also a high gain part of the project, since the direct measurement of wind rates and profiles would solve the disc dispersal problem once and for all, bringing about a real breakthrough in this field. If no suitable diagnostic can be found to directly invert emission lines to mass loss rates, we will calibrate the emission line measures using radio emission diagnostics (e.g. Owen, Scaife & Ercolano 2013). With regards to its dependance on the delivery of a chemical network from B2, some of the aims of B1 could also be obtained with simple (toy) networks, which could be successively updated."

Note as well that the tasks for PhD 1 in this project are already being carried out by Dr Giovanni Picogna (see structural changes section above), via the LMUexcelent initiative funding awarded by the LMU to Barbara Ercolano to support the project of the proposed Research Unit. We thus now request funding for one Postdoc position to further extend the position of Dr Picogna, who will then carry out all the tasks in project B1 of the new proposal.

1.B2.1) The time-variation of the grain distribution may not need to be simultaneously taken into account because the wind conditions vary on shorter timescales.
The idea here is that the timescales for the variation of grains may be comparable to the timescales of variation of the chemistry at the base of the flow. Hence the need perhaps to at least test the time-dependancy. We will of course start with the simplest model and add complexity as we go along. As we now better describe in the proposal, we will first
use the results from the time dependent dust evolution calculation of C1 (so that the Postdoc can do this job of coupling chemistry and dust evolution more easily), and then, perhaps in the second funding
period, we will all work together as a team to couple chemistry *and* dust evolution since the beginning of the calculation. We have changed the text in the description of this sub-project to reflect this.

1.C1.1) A more detailed work program was missing.
This project was completely restructured and a more detailed work program has now been included.

1.C1.2.) How do the observations from A1 constrain the models and how does this lead to a plan for the development and combination of the tools described?
In the new version of this sub-project we now make a more explicit mention of the comparison of dust distributions obtained from our models to those obtained from the observations in A1 (see point 3 of Work Plan)

1.C2.1) Why use a dust parameterisation and not the results in C1. Combination of complex codes may obscure physics.
Again we will proceed by steps. At the start we will use a standard unchanging MRN distribution and calculate its entreilment in the wind. We will then proceed to use the results of growth models in a simple parameterised fashion. The parameterisation have been shown to produce accurate results (Birnstiel, Klar and Ercolano 2012). A final step, as the referee suggests, will be to combine results from C1 to the model. This systematic approach will allow us to distinguish amongst the various effects and will also allow us to understand wether a more efficient, simplified approach may then be used in the future. We hope that this is now better explained in the proposal.

1.C2.2) The possibility of detecting dust in the wind raises the question of who in the team will lead the scattered light observations.
This was not well described in our proposal. We do not plan to necessarily conduct the observations within the context of the research unit. We will aim at providing estimates for the observability to decide whether it is at all worth trying. Some of the participants may be involved in observing proposals (e.g. with SPHERE) if our models indicate that the signature should be observable. This

will of course be complementary to the aims of the proposal, but not necessarily a part of it. Note that the main aim of the project is to construct a dust model for the wind, the observability issue is a by-product. The text in the new version reflects this. The inclusion of Prof. Henning as a team member is of course beneficial to the prospect of following some of the modelling with observations, if appropriate.

1.D1.1) The importance of dust feedback is not clear.
In the first set of simulations dust feedback on the gas will not be considered. In case we notice that the dust to gas ration reaches unity we plan to include this dynamical effect as well.
Even without this feedback new results will be generated as there are presently (to our knowledge) no multi
dimensional hydrodynamical simulations of these planet induced TDs that evolve the dust evolution simultaneously with the hydrodynamics.

1.D1.2) Are multiple grain sizes needed and how feasible is it scale the simulations to 3D?
It is very important consider multiple grain sizes as they will
behave dynamically differently, depending on their Stokes number. Full 3D simulations are still very costly that is why we plan those for some selected models only.
These simulations will be performed at the large
computer centres such as the Hochleistungsrechenzentrum Stuttgart (HLRS) or Leibniz Rechenzentrum in München (LRZ).

1.D2.1) A more precise workplan beyond steps 1 and 2 would be desirable
This project was significantly rewritten. The workplan is described in more detail in this new version

1.D2.2) The companion explanation should be contrasted with the explanation of dust trapped in vortices.
Indeed, this is now one of the items (3) in the work plan for this project.

REFEREE 2

General Comments

2.1 The efficiency/use of monthly video conferences for large groups are met with scepticism by this referee.
We propose to keep the monthly video conferences for talks within each Area, which will restrict the number of participants. A concise summary of the meeting will be compiled on a rotation basis by the students/postdocs in the area and will be then distributed to all members in the other areas.

2.2 The referee would have liked to see more about developing the postdocs as independent researchers and helping them on a career path to personal fellowships.
While we did not explicitly state this, we are perfectly in agreement with this referee that this is a responsibility of all advisers provide career advice. We have described our planned efforts to this aim in the Promotion of Early Career Researcher Section.

2.3 The referee is not sure about the use to assign funds to allow families to travel.
While we agree that it may not be possible always for other members of the family with jobs or school duties to travel with. However in many cases, particularly for families with small children this would be extremely useful. As we plan to employ early career researchers, it is indeed likely that they may have young children and partners may have paternity/maternity leave. The personal experience of e.g. Barbara Ercolano, who has now a 2 year old daughter, is that attendance to conferences the year after the birth, was only possible because of the extra family support funding she received, which allowed her partner and child to travel with.

2.A1.1 Project too ambitious for PhD student
The PhD student will be embedded in a group of students and postdocs. Marco Tazzari will complete the development of his code by the end of 2016 (the code will be used by the group). Greta Guidi will remain in the group working on high angular resolution observations of the dust properties. Baobab Liu remains in the group for 2 years and he is an expert of ALMA data reduction. The new student will be in charge of learning how to do ALMA data reduction with Liu, then use Tazzari's tool to derive disc population properties and analyse the Transition Disks properties in comparison with the full sample properties in the various regions.

2.A1.2 What is the role of the PhD in the project where various senior academics were involved
The PhD student will be in charge of deriving and comparing the properties of the TDs in relation with the full population. Our group has direct responsibility for the dust structure and properties and will use the outcome of the gas analysis from the collaboration. See also response to to question 1.A1.1

2.A2.1 How is variability in the accretion rate measurements accounted for?

We agree that the variability in the accretion rate may be a problem for the analysis, since it may contaminate the relation to the X-ray emission.

In order to address the problem of the time variability of accretion rates, we can employ our direct access to our new 2m Telescope on Mount Wendelstein. We will conduct photometric multi-color monitoring of selected star forming regions, which are among the aims of this project, e.g., the Orion Nebula Cluster. Our new wide-angle camera WWFI (providing a 0.5degree field-of-view) is ideally suited for this kind of monitoring. Taking 2--3 exposures in 3 filters every clear night will yield a comprehensive database for the characterisation of the accretion variability of individual stars on timescales from several hours to several years. This is all described in the new text.

2.B1.1 It wasn't clear to the referee that the observations obtained as part of A1 would be suitable for the comparison with the models presented here.
The referee is correct that we do not plan to obtain spectrally resolved emission line observations in A1. We have amended for this mistake in the new proposal. There are however public data already that can be compared with. Furthermore when our models inform us as to what line(s) could be useful we will propose for new observations. Finally, team members (Testi, Henning, van Dishoek) have a wealth of data and access to world class facilities which we would have access to.

2.B1.2 The project for PhD2 of project B1 is too ambitious for a PhD student.
We agree with the referee and are now asking for a Postdoc for this task. Note that the tasks planned for PhD1 of project B1 in the old proposal have started to being carried out by our LMU Excellent Initiative Postdoc (see description above)

2.C1.1 The project lacks clarity.
We hope to have improved on clarity in the new version of this sub-project.

2.C1.1 What is new and better about this project with respect to what other groups are doing.
We specifically address this point in the new version of this sub-project when we describe the tools of the proposed project. In particular the expansion to 2D (r, phi) to allow coupling to the 2D hydrodynamics is an innovation that will be a major part of this project.

2.C2.1 The referee says that one doesn't need the full treatment we propose here to estimate the observability of dust in the winds.
The observability of dust in the wind is only a secondary aim in this project. It comes for free. We need to look at dust entrainment in the wind to provide a detailed spatially-resolved dust model to do chemistry in the wind. This is crucial as the dust grains will not be equally distributed in the wind (see e.g. Owen, Ercolano & Clarke, 2012) and will affect the chemistry of the wind differently in different part. The simple estimate from a non-detection suggested by the referee is not sufficient for our aims. We have stressed this point better in the new proposal.

2.D1.1 The referee says: "I was surprised to see this case, which looks at planet formation as a route to disc clearing in transitional discs, which is essentially 'in competition' with photoevaporation. Which horse are they backing?"
We are not really sure about the meaning of this comment. Transition discs are a very diverse class of objects and it is well accepted that, depending on their specific properties (e.g. accretion rate versus inner hole radius) their formation route may be very different. As we now more explicitly discuss in the new proposal, Type 1 TDs (small inner holes, small accretion rates) are likely formed by photoevaporation and Type 2 TDs (large inner holes, large accretion rates and bright-mm fluxes) are most likely formed by giant planets. The point here is that we are interested in using both types of transition discs in order to study planet formation. Projects like D1, which targets Type 2 TDs can give direct insight on the planet formation process. Projects like B1 and B2, for example, which look at Type 1 TDs, can give direct insights into photoevaporation which influences the initial conditions for planet formation. We have added a more explicit discussion of all this in the introduction and re-iterated in the description of this sub-project.

2.D1.2 Are two PhD students justified for this project? How is the workload divided amongst the two students?
We agree with the referee that it would be better for the same person to carry out the project to avoid possible delays caused by late delivery of science products to be exchanged between two students. We now request funding for one Postdoc to carry out the whole project.

2.D2.1 This type of work is being done by different groups around the world, what are the unique strength on the proposed project?
In the reworked version of this sub-project the aims have been more explicitly stated. In particular we plan new full 3D simulations of discs, including models with an inclined planet/disc, coupled to dust evolution. To our knowledge this has never been attempted before and it heavily relies on techniques and expertise that we have been developing in our group over the years (for example the methods to include dust as particles in the hydrodynamic simulations performed by Picogna and Kley, 2016).

We are aware of only 4-5 codes that are able to treat the problem: Athena, Phantom (SPH!), Bates' SPH, Fargo and Pluto. An approximately similar number of groups are associated with these codes. Point 1 of our strategy is certainly nothing new, but it is important ground work that needs to be carried out as a launching pad for the further points. Point 2 has been approached already by (e.g.) Dong, Zhu & Whitney (2015) using the Athena code and including basically dust as a fluid, with only 1mm size particles been treated discretely. Already the techniques we recently developed (2016) for the discrete treatment of dust particles within a hydrodynamical simulation go beyond the limits of this work. Point 3 is already pushing beyond the state-of-the-art by attempting full 3D time-dependent hydrodynamical simulations, also including the possibility to study the effects of out-of-plane companion(s) (see also project D2) . This has certainly never been done before. Finally point 4 is completely uncharted territory. The relaxation of the isothermal approximation in the simulations is a necessary and innovative step for the field.

We hope that the reworked text in this sub-project makes these points clearer now.

REFEREE 3

This referee praised the proposal, the team and the topic highly, but he raised the general comment that many of the topics were not directly related to transition discs. We have already discussed this general comment above and below we provide answers for the comments on the individual tasks.

3.A1.1 Tasks A and B are useful but not centrally related to transition discs Task A1 deals with global disc demographics. It will use a large sample of discs, amongst which transition discs are a minority as far as we know. It is not clear what the goal here is for Transition Discs.. presumably all the new transition discs will have been found and published earlier by the native PI of ALMA data before their data become public. Disc demographics is interesting, and reducing/ modelling the data in a homogeneous way is useful as well. But the immediate necessity with respect to Transition Discs is not highlighted

We hope that our reworked version of the Introduction as well as of all sub-projects in this area makes the necessity with respect to Transition Discs clearer.

3.A1.2 Further the authors claim that dust growth will be studied. It is not clear whether they will have access to the necessary wavelength coverage to achieve this task rapidly enough and in a fraction of the sample that is large enough to produce groundbreaking results compared to current similar studies.

We have addressed this in the reworked version of the project, highlighting our proven track record and competitiveness in this field. Our group has been one of the leading groups in this field from an observational standpoint since many years.

Evidence of the recognised role of our groups in the ALMA and EVLA surveys is provided by the leading role that students and postdocs from the ESO group have in many papers from these programs. Tazzari (PhD student of Testi) developed his analysis tool and has carried out the multi-wavelength analysis for a sample of objects from the Disks@EVLA survey, he is now responsible for the dust structure analysis for the Lupus and Chamaeleon I ALMA surveys. Guidi (PhD student of Testi) is in charge of the long wavelength high resolution followup of the Lupus survey to study large grains confinement. Manara (former PhD student of Testi) is in charge of the combination of XShooter spectroscopy and disc properties from ALMA for both the Lupus and Chamaeleon I surveys (data from the projects PI-ed by Alcala and Testi). Due to space constraints we have decided not to include the paragraph above in the sub-project description to allow for more scientific content to be included.

3.A2.1 Mass accretion is a fundamental parameter to estimate, as is the role of X-rays in disc dispersal. But there is no indication on the amount of overlap between the X-Ray and X-shooter samples. Compared to current studies, only a significant overlap would lead to meaningful results? This is not discussed in sufficient details.

This point is now more explicitly discussed in the new version of the sub-project. We expect the statistics to improve from a few dozen to a few hundred objects.

3.B1 and B2 These tasks will produce "Radiation Hydrodynamics and chemical disc models " to identify new disc wind tracers. This is important for the dispersal of discs but in my view this is a separate problem from the transition discs we currently observe. This is a general disc evolution and dispersal. The link with Transition Discs is only partial. For example current estimations of mass accretion rates suggest that many transition Discs do accrete at a rate similar than normal star+disc systems. This is likely pointing to something else than winds for the clearing of these systems.

We disagree with the referee on this point. As we now more thoroughly and explicitly explain in the introduction, TDs are a very diverse class of objects. While it is true that disc winds may not be the dominant process producing Type 2 TDs, they are the most successful model which can explain type 1 TDs. Photoevaporation is the most promising dispersal mechanism which destroys the disc eroding it from the inside out via the creation of type 1 TDs. As well as in the introduction we now discuss this point also in the description of this sub-project.

3.C2.1 This is disc wind, not specific to Transition Discs.

The photoevaporation process is crucial for the formation of type 1 TDs as mentioned above. We mention the connection to TDs more explicitly in the description of this sub-project.

3.C2.2 Also as a subtask, it is indicated that edge on discs will be studied. A wealth of imaging data is available for Edge-on discs. Not all of them look like PDS144, far from it actually. This maybe relevant for photoevaporative disc winds but the region where the winds are lifting off from the surface will in general be shadowed by the outer parts of the faled edge-on discs . Including in PDS 144. This may complicate the interpretation a fair bit.

The main aim for this project is to provide a dust model of a photoevaporative wind that is needed in are B projects. The observability of the dust component in such discs would be a free by-product of our investigation. We agree with the referee that currently no proof exists that a disc wind has been detected in the dust continuum emission. Even in the case of PDS 144, which we modelled in detail (Owen, Ercolano & Clarke, 2012), we came to the conclusion that not all observational data (color inversion e.g.) could be successfully modelled. The case for less massive stars is of course even more difficult. However we have at the moment no realistic model for such winds. Our theoretical investigation may indicate wether such a diagnostic would be at all detectable with new state-of-the-art facilities. But we stress that this is a by-product and not the main aim of the sub-project. This is now better explained in the description of this sub-project.