

WEBVTT

1

00:00:00.359 --> 00:00:01.319

Susanne Höfner: Solar grains.

2

00:00:03.870 --> 00:00:13.590

Susanne Höfner: Or you can find pre solar grains in meteorites, for instance, that have a composition, that is characteristic of the stars.

3

00:00:16.590 --> 00:00:25.830

Susanne Höfner: And you can, and if the story is part of a close binary then they can also be mass transfer and.

4

00:00:27.210 --> 00:00:36.990

Susanne Höfner: As in public and private stuff can be progenitor so I put a Superman, so there are lots of independent of which are both of the.

5

00:00:38.460 --> 00:00:43.380

Susanne Höfner: life cycle you're interested in the good reasons to study the stars and the wins.

6

00:00:46.290 --> 00:01:00.240

Susanne Höfner: So quick introduction well how do we think that these winds work well, I already said, the stars are pulsating the GPS or pulsating and they have large scale convective motions when you see here is a slice.

7

00:01:01.260 --> 00:01:11.820

Susanne Höfner: When all historical model that will be the long time ago it's the density, that is shown here for slice through the Center of the star.

8

00:01:12.720 --> 00:01:20.760

Susanne Höfner: And the stars roughly the size and when you can see as a shock wave coming out sort of light colors mean high densities.

9

00:01:21.600 --> 00:01:33.930

Susanne Höfner: And the men, the shop reaches a distance of, say, two, three, still Arabia, then the temperatures has gone down to a level where you can form solids particles starters.

10

00:01:34.440 --> 00:01:47.640

Susanne Höfner: And then the luminosity of the star, which is like several thousand to several 10,000 sold them all cities will push the mixture of dustin castaway forming a week.

11

00:01:49.050 --> 00:01:55.980

Susanne Höfner: By the way, if you want to read up on some background rounds this topic, I wrote them.

12

00:01:57.930 --> 00:02:00.540

Susanne Höfner: Review, together with all of some while ago.

13

00:02:02.040 --> 00:02:02.760

Susanne Höfner: So.

14

00:02:05.160 --> 00:02:07.620

Susanne Höfner: Setting the stage for modeling.

15

00:02:09.360 --> 00:02:13.980

Susanne Höfner: So if we want to check if this kind of scenario that we have.

16

00:02:15.690 --> 00:02:24.150

Susanne Höfner: pieced together from various various indications is correct, then we need to do, quantitative models, the.

17

00:02:24.780 --> 00:02:41.760

Susanne Höfner: Minimum requirements of what needs to be included here like a recipe, so you need to take into account several types of dynamics so positioning conviction in the still interior, the shock waves that are triggered in the atmosphere.

18

00:02:42.840 --> 00:02:44.760

Susanne Höfner: The wind acceleration process.

19

00:02:45.810 --> 00:02:46.920

Susanne Höfner: You need to.

20

00:02:48.240 --> 00:02:51.660

Susanne Höfner: describe the dust component in a.

21

00:02:53.010 --> 00:03:12.150

Susanne Höfner: Time dependent moment equilibrium way because spring rolls is usually happening on on timescales that are comparable to the to

the formation sorry to the changes in gas temperature gas density and so on.

22

00:03:15.000 --> 00:03:19.770

Susanne Höfner: What you also need to do is to take into account the radiation field.

23

00:03:21.630 --> 00:03:25.770

Susanne Höfner: And exactly this variations and molecular basis.

24

00:03:26.940 --> 00:03:32.310

Susanne Höfner: If you put all of this into a model, this is of course a bit of an idealized situation, but still.

25

00:03:33.180 --> 00:03:43.110

Susanne Höfner: Then what you get all these two kinds of things you can get the wind properties of muscle straight wins velocities dust fields and so on.

26

00:03:43.740 --> 00:04:01.290

Susanne Höfner: And then you can take the structures to Detroit ready to transform pop of them and calculate all kinds of synthetic up, so it was like low in Paris spectra for poetry light curves interfering metric that you name it.

27

00:04:03.930 --> 00:04:04.770

Susanne Höfner: So.

28

00:04:08.250 --> 00:04:16.260

Susanne Höfner: i'm going to talk about two types of models today that we're using and developing here in solid so one of them are 3D models.

29

00:04:18.030 --> 00:04:35.490

Susanne Höfner: With the core Code and the main developer of this code is bound fighter, and in these models apply to HIV status, we have a global setup so one includes the Interior and atmospheric dynamics of star.

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00:04:36.330 --> 00:04:45.540

Susanne Höfner: And that's the very new thing also the the onset of the Austrian wind about back to that in the very end.

31

00:04:47.520 --> 00:05:00.450

Susanne Höfner: The problem with these kinds of models is that they are computationally costly, but of course the unnecessary to study turbulence and the origin of the complex structures India.

32

00:05:03.330 --> 00:05:06.840

Susanne Höfner: The other type of model that we're using a lot is.

33

00:05:08.220 --> 00:05:12.240

Susanne Höfner: One the time dependent radiation hydrodynamic moles.

34

00:05:14.010 --> 00:05:35.070

Susanne Höfner: call them darman models and the day you start just below the atmosphere you simulate the pulsation effects, with a variable boundary condition you focus on describing the ready to transfer the syllabus formation in detail, and so on and so on, so these are.

35

00:05:36.540 --> 00:05:49.050

Susanne Höfner: apple sphere and windmills basically a you see typical velocity profile snapshots you see how shockwave is going out here through the atmosphere and and how the wind is accelerated here.

36

00:05:50.280 --> 00:05:56.610

Susanne Höfner: So what I want to do first is to give you a few examples of what kind of things we can learn from these types of models.

37

00:05:59.070 --> 00:05:59.640

Susanne Höfner: start.

38

00:06:00.720 --> 00:06:09.930

Susanne Höfner: Starting with mentioning that they're very efficient a computation late compared to 3D models, of course, so what you can do is compute large prints.

39

00:06:10.440 --> 00:06:27.810

Susanne Höfner: covering a still a parameter space, and you can apply the Masters rates and US properties and so on, that you get from these models in still evolution or collective evolution models and study at the origin of chemical elements.

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00:06:29.910 --> 00:06:30.600

Susanne Höfner: So.

41

00:06:32.910 --> 00:06:34.230

Susanne Höfner: Like I said, for a few.

42

00:06:35.730 --> 00:06:36.570

Susanne Höfner: Examples here.

43

00:06:38.760 --> 00:06:43.470

Susanne Höfner: task is very close to my heart, this is where kind of started with modeling.

44

00:06:44.640 --> 00:06:49.350

Susanne Höfner: But it's also an essential component for getting the drive the wings so.

45

00:06:50.610 --> 00:06:52.470

Susanne Höfner: From observations, it has been.

46

00:06:58.620 --> 00:06:59.550

Susanne Höfner: inferred.

47

00:07:00.630 --> 00:07:06.570

Susanne Höfner: quite a while ago from my late 60s early 70s, but that should be.

48

00:07:07.680 --> 00:07:15.060

Susanne Höfner: silicate task rains in the envelopes of empire bgp stars, because there are some characteristic.

49

00:07:18.630 --> 00:07:24.690

Susanne Höfner: Feed spectral features at about 10 at Microsoft and the.

50

00:07:25.980 --> 00:07:27.360

Susanne Höfner: They are.

51

00:07:29.100 --> 00:07:33.150

Susanne Höfner: Pending and stretching modes of the basic here at the present or.

52

00:07:35.160 --> 00:07:37.230

Susanne Höfner: syndicates of the seo.

53

00:07:39.300 --> 00:07:40.590

Susanne Höfner: So this can come in.

54

00:07:40.590 --> 00:07:41.700
juliemcgeoch: Various forms.

55

00:07:43.980 --> 00:07:46.350
Susanne Höfner: But what what is kind of.

56

00:07:47.640 --> 00:07:56.730
Susanne Höfner: Interesting from a security point of view is that they consist of very abundant elements and perform at high temperature so they're good candidates for Dr wind.

57

00:07:58.890 --> 00:08:07.890
Susanne Höfner: What is hard to determine from observation is exactly this X here, so how much magnesium iron do in the.

58

00:08:08.940 --> 00:08:09.450
Susanne Höfner: brains.

59

00:08:11.040 --> 00:08:11.610
Susanne Höfner: and

60

00:08:13.260 --> 00:08:25.500
Susanne Höfner: If you just go nicely, for I want to drive a wing, then you would want to include a lot of iron, because then the material becomes a page, so you would get a lot of ready to pressure and.

61

00:08:26.400 --> 00:08:49.230
Susanne Höfner: That would drive to win the problem is that, in this case the grains also get very warm q2 absorption, so they cannot close to the stock So what we have been doing for a long time now, is model space on the assumption that that the silicate Greens are basically i'm free.

62

00:08:50.670 --> 00:09:01.530
Susanne Höfner: This material conform close to the star, but since the since it's transparent at visual in the infrared wavelengths where you have to sell a mix flux maximum.

63

00:09:02.040 --> 00:09:14.670
Susanne Höfner: You need to have large particles something like between point one and one micron so that the political will skip the radiation, instead of absorbing it, and by that making some.

64

00:09:16.380 --> 00:09:20.010

Susanne Höfner: produce radiative pressure, instead of social.

65

00:09:22.320 --> 00:09:31.440

Susanne Höfner: So I said in the introduction that the remote models, or one of the models are very efficient, so what you can do is you can really calculate.

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00:09:32.070 --> 00:09:43.710

Susanne Höfner: Thousands and thousands of them and very the input parameters that is Stella park parameters here, for instance they're color coded Panama city.

67

00:09:44.220 --> 00:09:58.260

Susanne Höfner: Then you can compare the wind properties that you get out friends muscles rate and we will also 32 observations here, you see the process our observations that come from from co line.

68

00:09:59.850 --> 00:10:00.540

Susanne Höfner: situations.

69

00:10:03.300 --> 00:10:17.100

Susanne Höfner: So you see that the models fit quite well with the observations one shouldn't be too worried that they cover a broad range here, because some of these combinations of still a promise may simply not exist in nature or be very rare.

70

00:10:18.660 --> 00:10:27.120

Susanne Höfner: But you can also do is calculate spectra from the from the structures and the to.

71

00:10:28.140 --> 00:10:36.240

Susanne Höfner: Some of the results in a nutshell, you get quite good spectra individual and the need for it, if you assume these kind of.

72

00:10:41.040 --> 00:10:44.940

Susanne Höfner: i'm free silicate grains what you don't get is.

73

00:10:46.020 --> 00:10:51.090

Susanne Höfner: These infrared mid infrared features here that were originally used to.

74

00:10:52.440 --> 00:10:56.670

Susanne Höfner: identify the grains, so this is a bit of a problem.

75

00:10:57.840 --> 00:11:00.630

Susanne Höfner: or not, depending on what you want to do.

76

00:11:02.100 --> 00:11:02.670

Susanne Höfner: What we did.

77

00:11:05.190 --> 00:11:07.140

Susanne Höfner: Recently, was to.

78

00:11:09.210 --> 00:11:15.420

Susanne Höfner: go from a situation where we simply assume that this is the green material to letting the.

79

00:11:16.680 --> 00:11:20.010

Susanne Höfner: model decide itself how much Irene wants to include.

80

00:11:21.150 --> 00:11:21.720

Susanne Höfner: and

81

00:11:24.330 --> 00:11:29.940

Susanne Höfner: The results which came out very recently in the paper money and they look roughly like this.

82

00:11:30.960 --> 00:11:34.350

Susanne Höfner: So let me walk you through this this is.

83

00:11:35.400 --> 00:11:45.270

Susanne Höfner: snapshots of Radio structure So here we have again the velocity which I showed earlier, you have shock waves here created by the pulsation going outwards density.

84

00:11:45.750 --> 00:12:09.330

Susanne Höfner: going from this steep decline to more wind like profile and here you see this steps here you to to the shock waves and the about 1.6 1.7 celery the grains the aspirin stop growing once they grow to a reasonable size when it gets accelerated the.

85

00:12:10.530 --> 00:12:13.290

Susanne Höfner: velocity it stable and you get an outflow.

86

00:12:14.670 --> 00:12:25.980

Susanne Höfner: The important message here is that the enrichment with Iran go back so what you see here is the iron magnesium ratio in the brains.

87

00:12:26.490 --> 00:12:38.100

Susanne Höfner: So the enrichment with iron is a secondary process, you can see that this only starts getting larger than zero after the grains have formed and basically have started to accelerate the wind.

88

00:12:39.270 --> 00:12:48.870

Susanne Höfner: And the other thing is that it's the low the various will be very low and so here you have typically a few percent.

89

00:12:50.850 --> 00:12:52.770

Susanne Höfner: So the grains will still be very.

90

00:12:54.210 --> 00:13:01.230

Susanne Höfner: Transparent but even this tiny bit of irony is actually enough to warm them up and create.

91

00:13:02.790 --> 00:13:04.020

Susanne Höfner: create the.

92

00:13:06.900 --> 00:13:08.580

Susanne Höfner: Emission features here, and let me be infrared.

93

00:13:09.780 --> 00:13:18.420

Susanne Höfner: So, and of course we also checked again the wind properties of the fit quite well with the observed values here you have.

94

00:13:19.770 --> 00:13:25.950

Susanne Höfner: The stars and Mayra variable to process our semi regular variables in case you're an expert on the sun's.

95

00:13:27.930 --> 00:13:30.210

Susanne Höfner: know what this is about so.

96

00:13:31.410 --> 00:13:32.130

Susanne Höfner: Somehow up.

97

00:13:34.020 --> 00:13:42.150

Susanne Höfner: What what we have recently or in recent years learned from from one the radiation hybrid models is that.

98

00:13:42.720 --> 00:13:58.680

Susanne Höfner: The winds of of MTV https as a product, driven by photon scattering on need transparency of grains so grains with a very low iron magnesium ratio, but large sizes, so this kept the lights and.

99

00:14:00.210 --> 00:14:09.090

Susanne Höfner: This gives both web properties and spectra that look very realistic competitive solutions.

100

00:14:14.760 --> 00:14:18.540

Susanne Höfner: there's one box here I mentioned in the beginning, that.

101

00:14:19.620 --> 00:14:29.220

Susanne Höfner: These are real atmosphere, so they don't include the pulsating layers of the star, so you set the boundary condition basically describing the pulsation.

102

00:14:29.880 --> 00:14:42.600

Susanne Höfner: At the inner edge of the model and the results, for instance, the muscles rates and velocities will depend on the on what you put in there, so some things you can exclude.

103

00:14:44.040 --> 00:15:00.840

Susanne Höfner: reasonably because it doesn't fit at all with observations, but if you really after protective theory of muscles, then you need to to have a way to prescribe the pulsations in in a consistent way and.

104

00:15:01.860 --> 00:15:06.870

Susanne Höfner: This is what we're trying to do right now, for instance, this is not.

105

00:15:08.100 --> 00:15:23.310

Susanne Höfner: pulsation of HIV status is a notoriously difficult problem, but there is some progress in recent years, so, for instance Michaela a bookie and company have made some some progress with one the radio position models.

106

00:15:25.080 --> 00:15:28.230

Susanne Höfner: We are looking into this if we can use them to to.

107

00:15:29.340 --> 00:15:46.530

Susanne Höfner: Use them in muscle spreads, but in the end also a one the pulsation model is only as good as the description of convection and convection is a three week process so in parallel we're also looking into.

108

00:15:47.670 --> 00:15:51.060

Susanne Höfner: 3D models as a solution to the problem.

109

00:15:52.920 --> 00:15:53.610

Susanne Höfner: and

110

00:15:55.200 --> 00:16:05.850

Susanne Höfner: What you see here is a time series of surface brightness of model star, as we call it star in a box.

111

00:16:06.900 --> 00:16:08.310

Susanne Höfner: done with the cold port.

112

00:16:09.330 --> 00:16:09.900

Susanne Höfner: and

113

00:16:12.090 --> 00:16:30.450

Susanne Höfner: The first thing that is very obvious, of course, that you have this convective structures on the surface, but when you look at that time series, then you also see that the star goes from bright to dimmer and then again too bright and so on, so the stories the model star is.

114

00:16:31.620 --> 00:16:41.640

Susanne Höfner: Has varying luminosity in the observed start this is interpret surrogate pulsations So the question was here to the models.

115

00:16:42.240 --> 00:16:58.230

Susanne Höfner: The 3D models pulsate, and this is not a trivial question to answer because, for instance, if you do a slice through the model Center of the model and you mark the radial velocity here in red is in falling blue is our.

116

00:16:59.400 --> 00:17:02.910

Susanne Höfner: outlets directed ready losses and you see that.

117

00:17:04.320 --> 00:17:12.000

Susanne Höfner: In the sense of or inside the States it's rather messy picture, and this is of course the convection at work.

118

00:17:13.350 --> 00:17:21.630

Susanne Höfner: So if you have a series of such pictures it's not trivial, to see if the story's picture pulsating what you can do is to.

119

00:17:22.920 --> 00:17:35.880

Susanne Höfner: To make radio so sorry means over spherical shells and then drop them as a function of time and then this one, you get this this kind of diagram.

120

00:17:36.300 --> 00:17:40.680

Susanne Höfner: And what you see, I should also say the stellar radius is somewhere here roughly.

121

00:17:41.340 --> 00:17:58.140

Susanne Höfner: So what you see is this pattern of red blue red blue and also what you get basically is a signal of real conversation and then what you see out here is traveling shock waves in the atmosphere, so the short answer is yes.

122

00:18:00.570 --> 00:18:11.430

Susanne Höfner: The corporate models are pulsating radio Lee and a quick comparison with observed period luminosity relations shows that the.

123

00:18:13.050 --> 00:18:14.160

Susanne Höfner: In the right ballpark.

124

00:18:15.630 --> 00:18:19.590

Susanne Höfner: I should also say there is a larger study ongoing.

125

00:18:21.120 --> 00:18:34.020

Susanne Höfner: One of our PhD students has analyzed the much larger set of models, including both HIV cells and supergiant and this paper in preparation about this topic and it's still looking quite good.

126

00:18:37.260 --> 00:18:49.860

Susanne Höfner: So um I have given you one reason why the what why one should go to the effort of doing 3D https or models radiation hide on an info wars.

127

00:18:50.580 --> 00:19:02.100

Susanne Höfner: And that is to get a handle on pulsation so you don't need to invent the recipe for connection, you have this giant convection cells so mixing length theory is just not a good way of.

128

00:19:04.230 --> 00:19:04.860

Susanne Höfner: Describing.

129

00:19:06.660 --> 00:19:10.380

Susanne Höfner: The other or another reason is that.

130

00:19:11.610 --> 00:19:19.470

Susanne Höfner: The large scale convection cells on the surface of the style we leads to a very.

131

00:19:20.490 --> 00:19:31.530

Susanne Höfner: In homogeneous atmosphere, so you get a network of shock waves in the atmosphere, rather than one nice very cool shockwave as you would have in a classical radio policy for maybe.

132

00:19:32.640 --> 00:19:45.360

Susanne Höfner: And that also means according to our models that the industry stipulation around the star should be affected, so it should be nice not Nice and smooth and spherical.

133

00:19:47.100 --> 00:19:49.500

Susanne Höfner: So what we.

134

00:19:50.880 --> 00:19:57.000

Susanne Höfner: have done is in several steps building up models that can deal with the situation, this is.

135

00:19:58.470 --> 00:19:58.560

Susanne Höfner: A.

136

00:20:00.300 --> 00:20:14.460

Susanne Höfner: paper from a few years ago, where we included dust formation in the 3D models in the same way, basically, as it is included in the one of the models, so the one beam also also also good workhorse for for.

137

00:20:14.970 --> 00:20:29.250

Susanne Höfner: figuring out what to put into the 3D models which take a lot longer to run across well, you can see here is a time series of density slices against the Center of the Star and.

138

00:20:29.340 --> 00:20:33.240

Susanne Höfner: Here in the upper quadrant, for instance, you see a shockwave that is.

139

00:20:34.710 --> 00:20:53.910

Susanne Höfner: running out of studios fear and the same hearing velocity So who is outlets direct velocities and what you see, is there is a new dust cloud emerging here at this location like directly in the wake of the shockwave.

140

00:20:56.970 --> 00:20:57.660

Susanne Höfner: So.

141

00:21:02.760 --> 00:21:15.300

Susanne Höfner: Like like I said that the moms are indicating that there should be in homogeneous circumstantial amelia, and this is also what you see in result observations, so this is an example taken from all nighter.

142

00:21:16.440 --> 00:21:21.000

Susanne Höfner: or nearby ATP star w Hydra.

143

00:21:22.020 --> 00:21:31.560

Susanne Höfner: What you get here is images in him polarized light so basically the stellar lights kept on dust and what you.

144

00:21:32.010 --> 00:21:50.400

Susanne Höfner: What you see is this little come to here is the size of the star, and you can see that the scattered lights that are scattered light is indicating that the task is distributed in clumps and not in not not spherical symmetrical on start.

145

00:21:53.010 --> 00:21:53.580

Susanne Höfner: there.

146

00:21:54.990 --> 00:22:02.850

Susanne Höfner: In this direction you see different wavelengths here to illustrate how it depends on that and the two roles indicate two different.

147

00:22:04.260 --> 00:22:12.090

Susanne Höfner: Times of observation, so one of them is near minimum and the other one the maximum and you can also.

148

00:22:12.420 --> 00:22:35.220

Susanne Höfner: reduce that the grain size changes and the both the timescales and the size of the brain on all of this fits quite well with the Darwin models so we think we kind of have a handle on what should go into 3D models so basically it wasn't a matter of getting the stuff done and i'm.

149

00:22:36.810 --> 00:22:44.580

Susanne Höfner: happy to present some very new results, these are not even published yet really.

150

00:22:45.750 --> 00:22:45.960

Susanne Höfner: All.

151

00:22:47.070 --> 00:23:07.380

Susanne Höfner: star in the box, including the stellar week, so what we earlier head was smallpox and we didn't have ready didn't have relative pressure on the bus, but these models now they have, as you can see a big box, so the star is this size here, so you go out to many, many is the lady I here.

152

00:23:08.490 --> 00:23:30.570

Susanne Höfner: And the radiation pressure on the dust is included in this models and I will show you three movies, now the first one is the density is represented by this image, the second one is the dust concentration, basically, and the third one is the radio losses so.

153

00:23:33.780 --> 00:23:34.860

Susanne Höfner: see if this works.

154

00:23:36.420 --> 00:23:38.550

Susanne Höfner: What you can see, you know in.

155

00:23:39.990 --> 00:23:54.120

Susanne Höfner: detail is how the how to start with its pulsation and convective motion sensor all is anything shock waves at regular intervals, or in your regular intervals here's why.

156

00:23:55.380 --> 00:24:03.360

Susanne Höfner: This nice going outwards here's one as well coming here now, I think, on this side and so on, and.

157

00:24:04.590 --> 00:24:10.290

Susanne Höfner: From the fact that these things just keep moving outwards, you can already guess that there's a wink.

158

00:24:12.090 --> 00:24:12.930
Susanne Höfner: Starting here.

159

00:24:15.690 --> 00:24:16.410
Susanne Höfner: If I.

160

00:24:20.100 --> 00:24:20.460
So.

161

00:24:22.170 --> 00:24:24.930
Susanne Höfner: If I go to next week and show you.

162

00:24:26.070 --> 00:24:34.500
Susanne Höfner: The best distribution or other the highest concentration, I should say it looks like this, so every now and then you see an event where there's a lot of.

163

00:24:35.250 --> 00:24:46.380
Susanne Höfner: Here now where there's a lot of dust forming and this is again in the wake of the shock waves when the materials compressed as soon as it has reached a distance, where the temperature is lower.

164

00:24:47.250 --> 00:24:54.990
Susanne Höfner: And sometimes these things make it and sometimes they don't use a one disappearing here, maybe this one just makes it.

165

00:24:56.670 --> 00:25:00.060
Susanne Höfner: Another one here this one didn't make it so what you have.

166

00:25:01.290 --> 00:25:14.910
Susanne Höfner: Going on all the time is basically a shock waves coming out compressing the material the past starting to form row, but sometimes this overlying pulsation and variation of the velocity will create.

167

00:25:16.800 --> 00:25:21.570
Susanne Höfner: X will creates variation the temperature India was fear.

168

00:25:23.160 --> 00:25:24.090
Susanne Höfner: Because the.

169

00:25:25.680 --> 00:25:46.650

Susanne Höfner: reggae defeating is changing, with the luminosity and sometimes the best brains will managed to push the material out here, and sometimes they won't because they start resolving again when it gets to walk you see some results now so some examples now here in the middle.

170

00:25:48.270 --> 00:25:48.900

Susanne Höfner: So.

171

00:25:50.100 --> 00:25:51.570

Susanne Höfner: quite complex system.

172

00:25:53.370 --> 00:25:55.170

Susanne Höfner: But if this.

173

00:25:56.220 --> 00:26:17.820

Susanne Höfner: Past flops are not convincing enough, I also have the radio velocity here for you so again red means in full force to stop lumens material going outwards way from the Star and what you can see here is again, this is the story itself so in here, you get these.

174

00:26:18.930 --> 00:26:22.590

Susanne Höfner: convective atoms large convective cells here.

175

00:26:24.060 --> 00:26:38.250

Susanne Höfner: And then on the near the surface shock waves are created dust forms inside the wake of the Stop Shop with and material is expelled by radiation pressure.

176

00:26:39.540 --> 00:26:48.120

Susanne Höfner: So you see that at the outer edge, almost all of it is blue, which means there's an outflow going on here in this mall.

177

00:26:50.970 --> 00:26:51.570

Susanne Höfner: So I.

178

00:26:53.040 --> 00:26:56.580

Susanne Höfner: Think i'm running out of time here whoops I.

179

00:26:57.600 --> 00:27:03.630

Susanne Höfner: Leave you here with my conclusions and thank you for your attention.