Doppler Sodar Report, 1999/2000 Season
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Circulation: IR, Phil Anderson, John King, Russ Ladkin, Alan Rodger, Mike Rose, Neil Cobbett, Frank Huebner (Scintec), Volker Thiermann (Scintec).

Key Issues

- how do we minimise the number of errors in the Doppler wind data?
- is it possible to improve the range of the Doppler wind data?
- what are Scintec's plans for an autonomous and/or remote FAS system?
- how will we power and control the FAS off-base?

Contents:

1. Introduction

A Flat Array Sodar (FAS64), manufactured by Scintec was trialed this season at Halley. The FAS uses phasing in the array to send sound pulses in different directions and thus obtain a three dimensional wind profile from the Doppler shifts in the backscatter. The FAS is extremely flexible with variable beam directions, pulse lengths, pulse frequencies and pulse sequences. It was firstly trialed on the roof of the Simpson building, at Halley Base (76^{o}S, 23^{o}W) and then off-base 5 km to the west of Halley.

Initially we had some software problems running the FAS, caused partly by our own lack knowledge of the PC's available for us to use at Halley, and secondly by out of date software. After consultation with Mr Frank Huebner (Scintec) we were able to obtain an updated version of the FASRUN software (version 1.8.1, replacing version 1.6). This improved the performance, although I still found that the PC running FASRUN 'froze' every time data was transferred from the Sodar Processing Unit (SPU) to the PC, i.e. once every pulse sequence.

The roof of the Simpson building was the initial site for the FAS antenna, so it was powered via the platform mains supply and linked to a desktop computer. After a few days of trialing, some acoustic padding was placed into the sodar box, but despite this, *the FAS was unacceptably noisy for long term use at Halley, both within the Simpson platform and around the base.* We also found generally poor results in FAS performance while on Base - a large percentage of Doppler wind errors and a poor range. It was surmised that part of the reason for the large number of wind errors were fixed echos from buildings on the Base, as well as noise pollution from vehicles and maintenance work and so on.

We therefore decided to move the FAS off-base to a ‘clean’ site, a 0.5 m deep pit 5 km west of Halley. Here the FAS was powered by two 12 V lead acid batteries, and talked to Phil’s Panasonic Toughbook laptop (the only laptop of three that it worked with). Due to the high power consumption of the FAS/laptop set up, the FAS could only be run for a limited time - of the order 4-12 hours.

In general the results from the off-base site were an improvement, particularly with a reduced number of errors in the Doppler wind calculations. However the range achieved (ie. the height of wind profiles) was still disappointingly limited - between 100 and 400 m depending upon the meteorological conditions. The limited range appeared to be mainly due to a poor signal-to-noise ratio, ie. the backscatter was not great enough. It was suggested this was due to the laminar nature of the atmosphere (F. Huebner) or simply not enough power in the transmission (P. Anderson).

2. Setting up the FAS configuration

In this section I will describe the easiest way I found to set up FAS experiments. The FAS is controlled by the FASRUN software, at the moment version 1.8.1. The comments below are rather general in nature and are intended to compliment the FASRUN software manual. The software allows the setting of:

Cycle - that is the beam direction pattern, e.g. Vertical only, East/North/Vertical etc. I usually used the 5 beam operation cycle (V/E/N/V/S/W) and the setting “minimum gap between pulses”. Three directions must be set to allow a three dimensional wind field to be calculated.

Pulse sequence - I usually set 10 pulses in a sequence, with each pulse a different frequency. For simplicity, I always used the setting “same sequence for all titled beams”. I always set 10 sequences in each direction.

Pulse duration and vertical resolution - setting the pulse duration is a trade off between accuracy and vertical resolution. The longer a pulse duration the greater number of waves transmitted, so the better the echo spectra and thus the more reliable the Doppler wind profile. The trade-off is that a longer duration of pulse means a lower effective vertical resolution. For example, for a constant pulse duration of 50 metres (equivalent to a duration in seconds of duration (m) x speed of sound), the best effective vertical resolution is 50 m. The vertical resolution can be set to <50 m, but this is misrepresenting the data.

Pulse frequencies - the textbook sodar setting is to use a monotonically increasing set of pulse frequencies within each sequence. Note that lower frequency waves propagate more efficiently to higher altitudes. It is standard practice to use longer pulse durations with lower frequencies and shorter pulses with higher frequencies, as this keeps the number of waves per pulse more constant. Hence a textbook setting would be of long low-frequency pulses rising to short high-frequency pulses. The shorter duration high-frequency pulses thus allow better vertical resolution at the lower levels. Note that another constraint is that the frequencies of neighbouring pulses should not be so close to each so as to interfer (see Manual page 14). A further restriction particular to the FAS is that the piezo-electric transducers are more efficient at frequencies above 2000 Hz. This restriction means that many of the examples provided with the FASRUN software use low-frequency pulses at the end of the sequences - a ‘hat’ pattern. I tended to favour frequencies greater than 2000 Hz.

Gain - I always used automatic gain control.

Algorithms - a number of special algorithms are available with the software. I generally left these as default settings, although I did adjust the "Backscatter" settings to more realistic values for the wind speeds. The wind gradient criteria was confusing as the default setting is 5 m s^{-1} which is not a gradient! This also seems restrictive, for example, one can have a jump of 0 to 10 m s^{-1} quite easily between 0 and 20 m above ground.

Measurement - I usually set the main data period to 10 or 15 minutes. Note if the full cycle takes longer than (say) 15 minutes, data is still output every 15 minutes simply using all the readings available up till that point.

Data visualisation - the data are stored as simple ASCII files, one table of data per main data period. There was no easy was to view the main data (.mnd) files, I used a spread sheet, but that was not very satisfactory. In general the data visualisation software that is included with the FAS is rather crude. Viewing the backscatter pictures is straightforward via a sodargram, although it would be nice to be able to control the settings of this picture and also to save it. It is only possible to view one wind profile (or spectral analysis) at a time, which is rather annoying, and again it would be nice to be able to control the pictures more and save them out. The relatively crude data visualisation is not a big problem as one likely to import the data into a more powerful data analysis package (e.g. IDL/Matlab) anyway, but it was a bit frustrating at the time.

3. Experimental settings and results

While at Halley I made up a series of experimental configurations which I tried to test in a scientific way. However the changing atmosphere meant it was, and has been, difficult to interpret the performance of the different configurations from this small number of experiments. For the sake of brevity I will only discuss results from the off-base site, where performance was in general better than when the FAS was at Halley. Recall at the off-base site there were no fixed echos or environmental noise.

In all the settings discussed below, the range was 500 m, the cycle was the 5 beam setting, 10 pulses per sequence were used, with 10 sequences per beam direction. The pulse duration, pulse frequency and vertical resolution were varied.

9/2/2000 - exakagi setting and ian500 setting

The standard exakagi setting used constant duration pulses (30 m), a constant vertical resolution (30 m), and an increasing monotonic sequence of frequency transmissions from 2004 to 2741 Hz.

We have 5 hours of data, 13:50 to 19:40. The backscatter drops off sharply above 100 m (Figure 1). The wind range is initially up to 300-350 m, but dropping to around 200 m. Wind quality is generally good initially, becoming poor as the range dropped.

The ian500 setting used decreasing pulse durations (50 to 10 m), an increasing vertical resolution (from 20 to 60 m) and a monotonic frequency transmission 2004 to 2741 Hz.

The FAS was reset around 19:40, and we have data from 20:00 to 23:30 (Fig. 1). The backscatter volume was generally greater than for exakagi, probably due to the longer duration transmission pulses. The wind range also improved back to 300 to 350 m, with a good wind quality. The signal-to-noise ratio is generally better than the exakagi setting.

10/2/2000 - ian503 setting

The ian503 setting was similar to ian500/ian501, but with pulses 1 to 5 using lower frequencies, i.e. starting at 1765 Hz. The pulse duration and vertical resolution are the same as ian500/501.

We have data from 18:57 to 21:32. There was very low backscatter on both the FAS and the old Sensitronic sodar during this period. Wind range typically only 200 m, although again the wind quality was generally ok. Error messages indicate poor signal-to-noise ratio at higher altitudes. The lower frequencies did not noticeably improve the range, but the backscatter was very weak through this period.

12/2/2000 - ian506 setting and ian505 setting

The ian506 setting used the same frequencies as ian500/501/502, but longer durations, i.e. 60 to 20 m.

We have data from 13:00 to 14:00 only. The wind ranges were typically 300 m and the wind quality was ok. Poor signal-to-noise was mainly responsible for the reduced wind range.

The ian505 setting used the lower frequencies of ian503, but longer pulse durations as 506 (i.e. 60 to 20 m).

We have data from 18:00 to 22:45. Wind range typically 300 m. Appear to be lots of bad data due to the wind gradient limit criteria. Decided to change this for the next run.

14/2/2000 to 15/2/2000- ian502 setting

The ian502 setting was the ian500/501 setting with a higher vertical resolution.

Data from around 20:31 to 08:43 the next day. Note the interesting U-shaped 'negative' echo in the backscatter (Fig. 2)- any ideas ??? Compare this with the Sensitronic backscatter sodargram for the 15th (Fig. 3). The U-shaped 'negative' echo is not there. The greater vertical resolution of the Sensitronic sodar (3 m ?) shows a lot more elevated layering in the backscatter as well as better definition of the low-level return. Such fine detail is not picked up by the FAS (backscatter resolution 10 m). It may be the case that the FAS does not have high enough resolution to evaluate wind profiles for our common 'elevated layer' events. The winds pick up around 07:00, after very low winds overnight. The wind range only 100 to 200 m. The pick up in winds is coincident with an enhanced echo.

For this period we have a good comparison between Doppler sodar winds (e.g. at 20:31 - Fig. 4) and the down profile of a kite flight (Fig. 5). Recall at this time the FAS was off-base so there is a 5 km difference between the locations, but the flow is easterly, so the air passing over the kite location will pass approximately over the Doppler sodar location a short time later. The kite down profile from 20:18 to 20:41 has 2-3 m s^{-1} winds up to around 50 m and ~4 m s^{-1} winds from 60 to 250 m. The wind direction is constant with height at ~110^o. This matches extremely well to the Doppler sodar wind profile at 20:31.

16/2/2000 - ian506 setting

Setting as above. Only 15:00 to 16:00 data, before battery failure. Wind range 200 m.

4. Power consumption

A power consumption test was carried out using a current versus time meter (courtesy of J. Davies). Two configuration settings (the exakagi and example1 settings) were used. For a 240 V supply, the base current (i.e. the listening current) was 200-240 mA, the peak current (i.e. when transmitting) was around 1000 mA and the average current for the exakagi setting was around 400 mA. These translate to a peak power consumption of 240 W and an average power consumption of around 94 W.

5. Discussion

There is clearly still plenty of work to be done in optimising the settings for the stable boundary layer situations prevalent in Antarctica. Indeed I suspect this will be an evolutionary process with the help of trials in the 2000/2001 season and beyond. I am beginning to come to the conclusion that the limiting factor in the Doppler wind range is not the FAS configuration but simply a limit of the signal-to-noise ratio in the backscatter. In other words, the stable boundary layer is inherently laminar and so not turbulent enough to calculate extended wind ranges using acoustic techniques. If this is the case, we may have to be content with 100 to 400 m ranges, depending on atmospheric conditions.

Although the height range of the FAS64 was a little disappointing on the evidence of this summer, I would suggest that our overall objective of observing winter-time katabatic flows is not heavily compromised. It will be the case that katabatic flows will generate turbulence, so should be highly reflective of the acoustic pulses.

I think there are good prospects for the FAS64 to achieve our objectives of measuring katabatic winds at a remote site in an autonomous fashion. The limiting problem being how to power and control the FAS system off-base; some of our ideas include:

- power - from an array of lead acid batteries. Note two 100 Ah lead acid batteries would only last ??? (100/0.4 ?).
- power - from hydrogen cells (expensive ? unreliable ?).
- power - battery recharging from wind turbines (the noise from these should not be in the same frequency range).
- control - from a automatic weather station logger (but FASRUN at present only runs under Windows - need a DOS version).
- control - using a high-frequency radio link to control the SPU from Halley ?
- control - using a high-frequency radio link to control a logger ?

The power and control of the FAS system is the subject of a separate Q3 workpackage, which will probably be lead by Russ Ladkin.

Appendix - Correspondence with Scintec

A number of interesting points are illustrated in the following email discussion between myself and *Frank Huebner of Scintec*.

Dear Scintec,

We recently purchased a FAS64 sodar from you for use in atmospheric boundary layer profiling here at Halley Base, Antarctica. My colleague Dr Phil Anderson and myself are currently testing the FAS64 here at Halley and have run in to several problems. I hope you can help us out with some of these problems.

Firstly I would note that the SPU and Power Unit both appear to be functioning ok. The SPU self-test gives no problems. The SPU appears to both emit and receive ok.

1. We are having considerable problems with the FASRUN software. At the moment we are running FASRUN under Windows NT on a 75 MHz Pentium PC, with 32 MB RAM and 0.5 GB hard disk.. FASRUN appears to run, but uses 100% CPU almost all the time! Even running under exsdgr2.set (ie. backscatter only) the CPU is still 100% FASRUN. Is this normal ?
Question 1: 100 % CPU time. This is depending on the version of the software (the newest software version is 1.8.1). The behavior is normal, if the FASRUN program is waiting for data from the SPU it takes unfortunately 100 % CPU time. We once had a software which gave back the task to the operating system by using a Windows API call, but this function was not working with Korean or Japanese Windows (all European and US Windows variant were fine). The software suddenly stops during execution of the API call in East Asian windows versions. So we were forced not to use this routine. I am not sure at the moment if we have got a current version which does not use all 100 % CPU time but I will check this for.

2. We have been wondering where the main processing is being done ? If the main mathematical processing is being done in the SPU unit, and only data is being passed to the PC, why does the PC freeze at the end of every cycle ? Does it really take 100% of CPU to read and display the data ? Using the Task Manager it appears that FASRUN is not responding a lot of the time.
Question 2: The main mathematical data processing (performing the FFT of the data) is done inside the SPU. Archiving the spectra and calculating winds is done by the FASRUN software on the PC at the end of a measurement cycle. The PC is occupied also during data transfer, then the software may not respond quickly, especially at slower PCs.

3. We have not yet had any believable wind profiles. The wind profiles (using example1.set, example2.set or example3.set, or our own settings) are either almost zero wind speed or 99.99 (error values). This does not correspond to our radiosonde ascents, which indicate approx. 10 m/s winds between 100 -1000 m. We are most concerned about this lack of any wind profiles.
Question 3: This is difficult to answer. I need more information to give a good answer. As you say, the wind speed is almost zero, I

assume that you have got fixed echos in the data. Therefore I would like you to send me some measurement data.
To get the best results I would like you to run the sodar with the "exakagi.set" setting. Please save the raw spectra too (in the Main->Data->Output menu), for the case I need them later. If you can send me some spectra (*.spc files) as well as some *.log and some *.mnd files from this measurement this would be very helpful. If may be useful to do this with the newest software (see answer to question 5).

4. I believe that my colleague Dr Anderson talked to you before our purchase of the FAS64 about our intention of running it remotely (in Antarctica) with a remote power supply and a simple logger to store the output data. To do this we would need simpler software than FASRUN to operate the machine. We were hoping the sodar would come with a simple DOS based operating code, as well as a more complex Windows based system. Will this be the case? In addition, believe Dr Anderson arranged for us to obtain the source code for FASRUN.
Question 4: I have to check this for with Biral....
To your question 4: I checked with Biral about the communication concerning a DOS version. James Squires did not know anything about this. He told me, that there were discussions about providing the source code, but there has no agreement signed yet.

Anyway, it is planned (the first studies been done already) to build a FASRUN software which can be completely controlled remotely. I hope this version will completely need your demands. Unfortunately, this needs a complete rewrite of the software. I can not give you a time schedule when this software will be ready, but I do not expect it to be ready in the first half of this year.

5. Using the View data feature and viewing archived *.bck files causes FASRUN to crash.
Question 5: I never heard before that viewing the *.bck files crashes the FASRUN software. If you have got an older one than version 1.8.1, I can send you the newest software by email, you only have to exchange the FASRUN.EXE and the FASRUN.SPU program, as the libraries provided by Microsoft have not changed. This also can answer your question 7.

6. In the manual, and as is well know, monotonically ascending sequences are optimal for multi-frequency sodars. However you examples 1,2,3 are go up then down at the end - frequences from 2000-2700-1700 Hz. Why do they go down at the end ? Surely this is not optimal?
Question 6: For sure, lower frequencies are better for reaching higher altitudes because of atmospheric transmission. But there has to be taken into account the efficiency of the sodar (here the transducers), which is frequency dependant. The transducers are of piezo electric type, thus very efficient, but the efficiency decreases at frequencies below 2 kHz. This is the reason why the lower frequencies were used at

the end of the cycle.

7. Do you have any more recent versions of the software that are more reliable ? Most of the code files are dated 11/01/96 and the example files are from 28/04/99.
Question 7: See answer to question 5.

We were given version 1.6 of FASRUN, so it seems we are several versions behind what you have now.
I attached a copy of the newest FASRUN software (FASRUN.EXE and FASRUN.SPU). As I wrote in my last message, the software does not need newer libraries, so you can copy the software in the FASRUN directory on your hard disk. To be on the safe side, I recommend making a backup copy of the old software.
There are some improvements in the new software. The new software does not use 100 % CPU time and it is faster than the old one (and it is working on Korean Windows). Though, I do not expect to consume all you CPU time, there are some calculations done where the PC is heavily used. As an example on a AMD K-6 200 Mhz PC the typical CPU load is less than 10 %, except for the end of the measurement cycle where the processor is fully used.

8. I have been wondering about the data averaging periods. If you are running a cycle of say ENVSWV, with 10 sequences per direction and 10 frequencies per sequence. This will take some time, say 10 seconds per sequence (ie. 100 sec), with say 20 secs at the end of the sequence, makes 120 sec per direction, therefore 120x6 = 720 seconds = 12minutes per full cycle.
a) Does this mean that the minimum main data period should be more than 12 minutes ?
b) If you set the main data period to say 20 minutes does it use one and a half cycles of data to generate the (wind) output after 20 minutes ?
c) If we wanted more rapid data (eg every 10 minutes) would it be better to use a shorter cycle (eg. ESV only)?

All you answers are correct. There is only one thing you did not know: The wind software does not care about the number of soundings of cycles in one direction. You can have a different numbers of soundings in all directions, which will often be the case if you set the main data period to 20 minutes. Even when a full cycle is e.g. ENVSWV, the software can calculate a wind profile after having sounded only three directions, e.g. ENV. Thus, the minimum data period is 6 min. Though, it is possible to get more rapid data by only setting the data period to a shorter value.

There is only one disadvantage of doing this: The signal-to-noise ratio decreases because the number of soundings in a data period is lower. And this will decrease the range. You always have to choose between range or resolution (spatial as well as temporal). If you want *to get a larger range, you should decrease the resolution. This relation is taken into account at the examples settings. The large range examples does not come with short averaging periods.*

If you want to get a better resolution, I recommend using a shorter emission cycle and reception range. The "exakagi" setting is e.g. a good starting point for a setting with shorter averaging time (10 minutes) as well as a reasonable range (up to 500 m) and vertical resolution (30 m). We have had good experiences with this setting, getting good data up to 500 m.

9. In the manual you say the cycle should be site-dependent - we have some building etc to the north and west and nothing (literally just a flat ice shelf for kilometres!!!) to the south and east.
a) Would we be better using a ESV setting as standard?
b) Are mirrored directions always used ? ie. does using ESV mean +29 in E and then -22 in west ?

I have not had a look at the spectra, but it seems to be reasonable not to use the directions where the buildings are located. The answer to your question 9 b) is that in all our examples the mirrored directions are used. You can switch the mirrored directions off (Emission Editor), but you will have to either decrease the wind range or the number of frequencies emitted. In the first case you can change the direction from 29 to -22 degrees and use frequencies in between the other ones. As it is written in the manual, the wind range will be lower than before. In the second case you will only use five frequencies, thus emitting only half of the energy as before. This may result in a lower range.
Before doing this, I would like to have a look at the spectra. If you can tell me your requirements I can try to find a setting which meets your demands.

We have a manual dated March 1999, rev 0.52, which recommends keeping 10 sequences before switching direction - so have been doing that.
This has not changed in the new software.

The following comments refer to a set of data I sent to Mr Huebner.

Thank you very much for sending me all the data and the plots from the tether sonde. I looked at the data and try to describe you what I found.

1. The gain settings are at very high levels. This indicates a low level of mean environmental noise.

2. The sodar is partially affected by environmental noise. During the whole period some spectra (typically around 10 %) were rejected *because of sudden noise. Because of the low level of mean noise, even a very weak signal would be detected by the sodar as sudden noise and rejected. This is (in my opinion) no problem.*

3. At these wind conditions it is very difficult to find a direction with less fixed echos. The wind is too weak to distinguish between fixed echos and atmospheric echos. But I will try to have a close look 1at the data and to distinguish fixed echos and atmospheric ones by spectral widths.

4. As you wrote, the wind speed is very low and there is a weak inversion. I discussed your plots with a meteorologist and he thinks that the flow is laminar. The consequence: there is very weak turbulence. Unfortunately, a sodar relies on turbulence to get atmospheric backscatter. This would explain why the signal is weak, thus why the range is low. This explains too why you can see a lot of fixed echos: If the atmospheric signal is weak, even weak fixed echos are heared.

A quick question:
In the exakagi setting (for example) you have set frequencies for the titlted beams
2004 2004 2176 2176 etc
for the main and mirrored directions.

Why do you use the same frequency for the main and mirrored direction ?
Do the returns not interfere with each other ?
I thought using the same monotonic sequence as the vertical beam would be better ?
ie. 2004 2073 2141 2227 etc

Typically the returns of two directions (29 and -22 degrees) only interfere very weakly. If there is a chance of interference (e.g. if you have got strong fixed echos) then it may be better to change the sequence to an increasing one.

You will be pleased to hear that we have had some more successful trials with the Doppler sodar over the last couple of days. We decided to take the FAS off the base, 5 km away in the middle of the flat ice shelf. We placed the FAS in a 50 cm hole to act as an acoustic shelter. The power is supplied straight from DC via 2 x 12 volt batteries and the FAS is controlled by a laptop computer, also running from the 12 volt battery. Because of the high power requirements of the FAS we cannot run it for long periods.
Yes of course, I am lucky about this!

Yesterday we ran two settings the exakagi setting for around 5 hours and a setting of mine (called ian500) for 3 hours in the evening. I enclose some data from the ian500 setting and also the .set file in case you are interested. It has variable pulse duration (monotonically decreasing, with increasing frequency).

I will have a look as soon as possible at the data.

In the manual, you discuss the pulse durations and it is to be honest rather confusing. You indicate that the vertical resolution should not be lower than the shortest pulse duration. eg. if pulse duration is 20 m , lowest meaningful resolution is 20 m. This is ok.
But I am not sure about higher up in the profile.

Here is an example to see if I have understood:
-suppose you set 10 pulses: 5 with duration 50 m (low frequency), 5 with duration 20 m (high frequency).
- then set vertical resolution to 10 levels of 30 m (ie. range 20 to 320 m)
Will the 50 m pulses contribute at all ?

One would imagine the best way would be 50 m pulses to give a lower resolution profile, with more detail added on top by the 20 m duration pulses somehow ???
Or is it the case that only pulses of duration smaller than the vertical resolution can contribute ?

for example in the ian500 setting:
- the lowest two frequencies have duration 50 m.
Do these contribute to layers 20 to 100 m (20 m resolution) or 100 to 220 m (30 m resolution) or 220 to 340 (40 m resolution) ?
Or do they only contribute to layer 340 to 440 (50 m resolution) and 440 to 500 (60 m resolution) ?

I must admit that choosing a good setting is complicated. In know this, and it is planned to make a different software user interface where you only have to define the resolution and the wind range you are interested in and where the software itself calculates the frequencies used. Anyway, you will still be able to alter frequencies or durations.

The algorithm for combining all different pulses works in the first stage independently from the vertical resolution settings. The spectra from all different frequencies at all 10 m levels are combined BEFORE vertically integrating the spectra (due to the chosen resolutions). This algorithm takes into account that depending on the altitude you can not hear all frequencies. E.g. at 20 m altitude you can only hear the echo of the last emitted frequency because the frequencies emitted before already has reached higher altitudes. Thus, *it is possible to use pulses with 50 m length and resolutions with 10 m, while all possible frequencies are used. The real (atmospheric) resolution will then be 50 m, even when the data are given at 10 m range gates. To get the best possible range pulse lengths and vertical resolutions should match each other.*

For example if you use pulse lengths of this sequence (first to last):
100, 80, 50, 30, 20, 10
then you should choose the resolutions (lowest to highest):
10, 20, 30, 50, 80, 100, 100, 100, ...

I hope this answered your question. If you have not understood anything please do not hesitate to contact me.