



Servicio
Meteorológico
Nacional
Argentina

Nowcasting verification process in Argentina's Weather Service (SMN)



**International Verification Methods Workshop Online
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Outline

- Argentina's weather service Nowcasting product:
 - Meteorological phenomena
 - Nowcasting tools
 - Constraints
- Verification sources
- Verification database
- Results
- Next steps

Nowcasting product

Consist of short-term strong and severe weather warnings that are issued for the following meteorological phenomena:

- Hail
- Heavy rain
- Wind gusts

Valid for three hours after issuance.

Thresholds

Strong storms:

- Gusts between 60 and 90 km / h and / or
- Hail between 0.1 and 2.0 cm and / or
- Accumulated rain between 20 and 40 mm in one hour

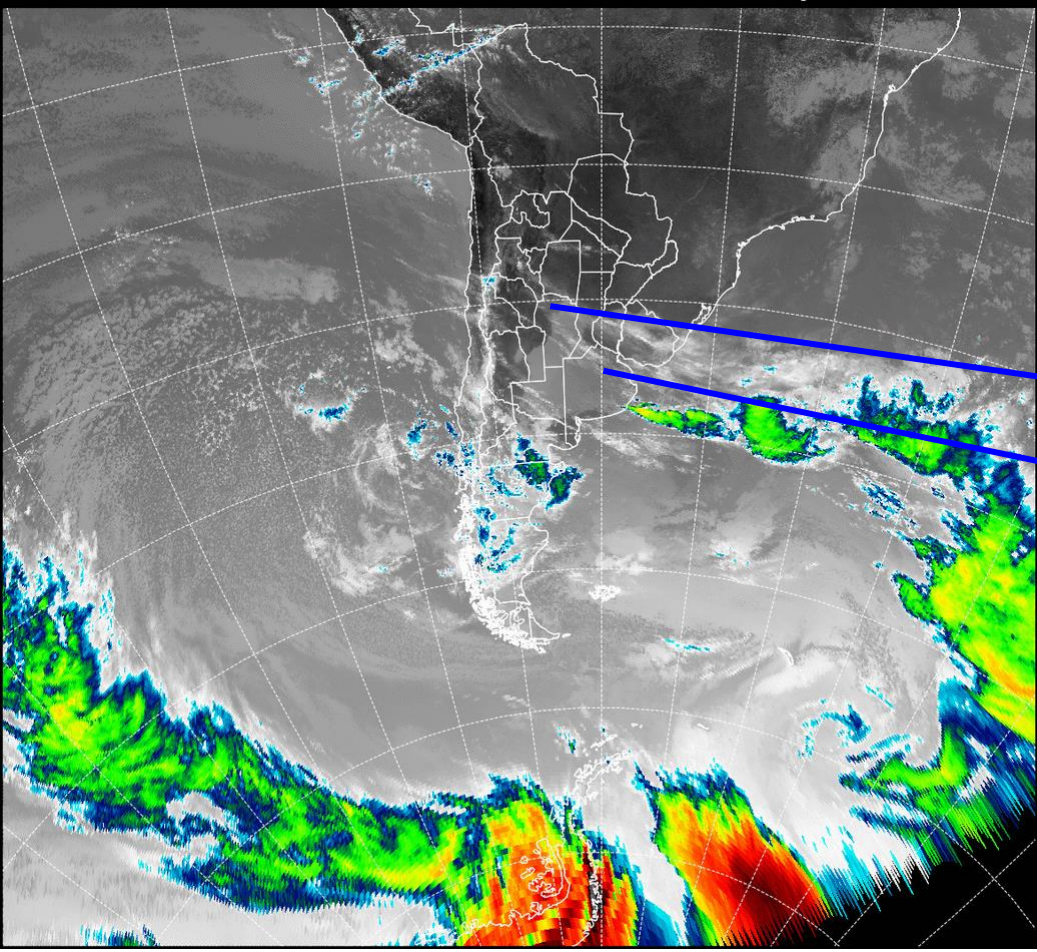
Severe storms:

- Gusts higher than 90 km/h
- Hail greater than 2.0 cm
- Accumulated rainfall greater than 40 mm in one hour

Nowcasting product

Weather surveillance is carried out with the help of:

- Weather radars
- Satellite imagery
- Lightning detectors
- Official and unofficial weather station networks



Argentina

Buenos Aires

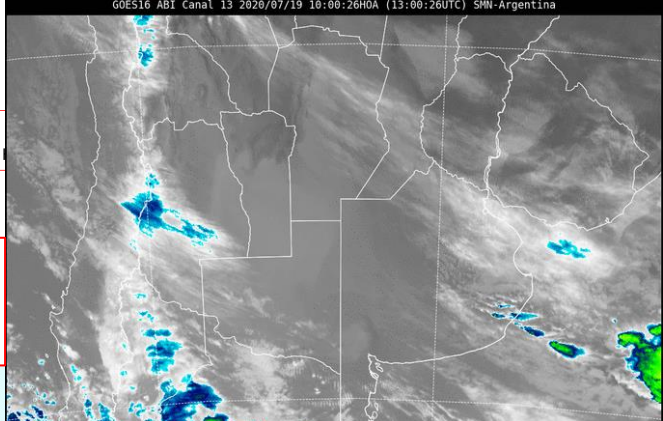
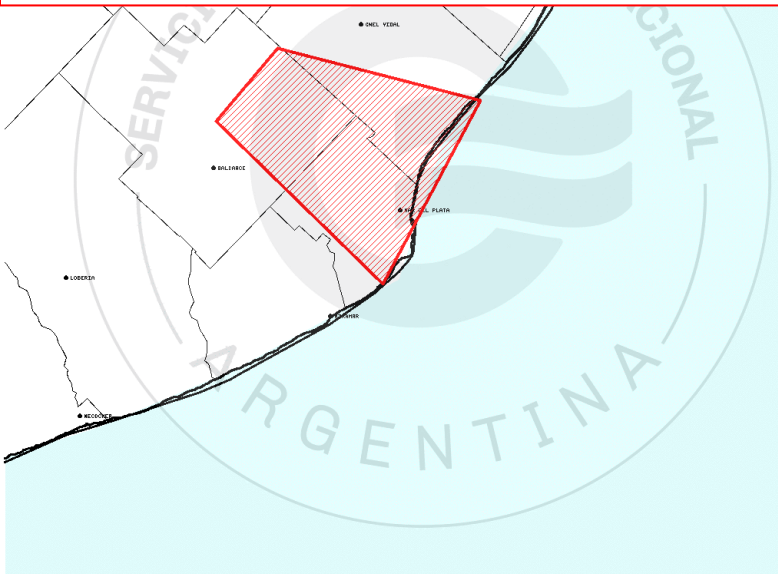
AVISO A CORTO PLAZO

19/07/2020 a las 14:02

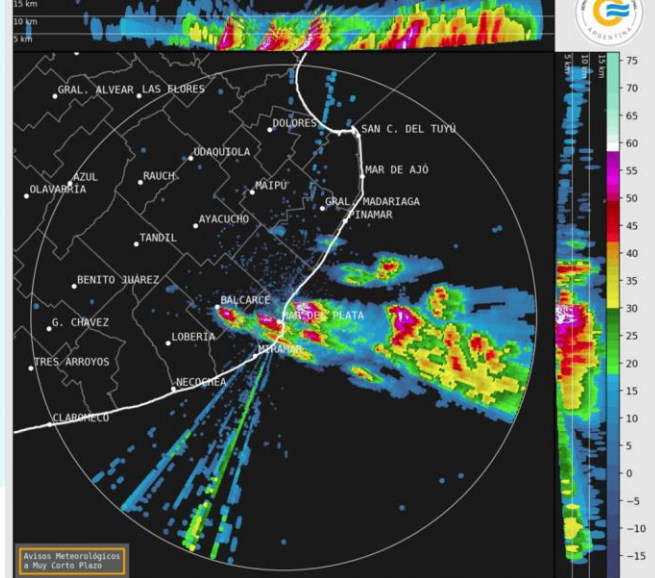
EL AREA GRAFICADA EN EL MAPA DELIMITA LA OCURRENCIA DE:

TORMENTAS FUERTES CON RAFAGAS Y OCASIONAL CAIDA DE GRANIZO.

Warning: Strong storms containing winds gust and occasional hail fall



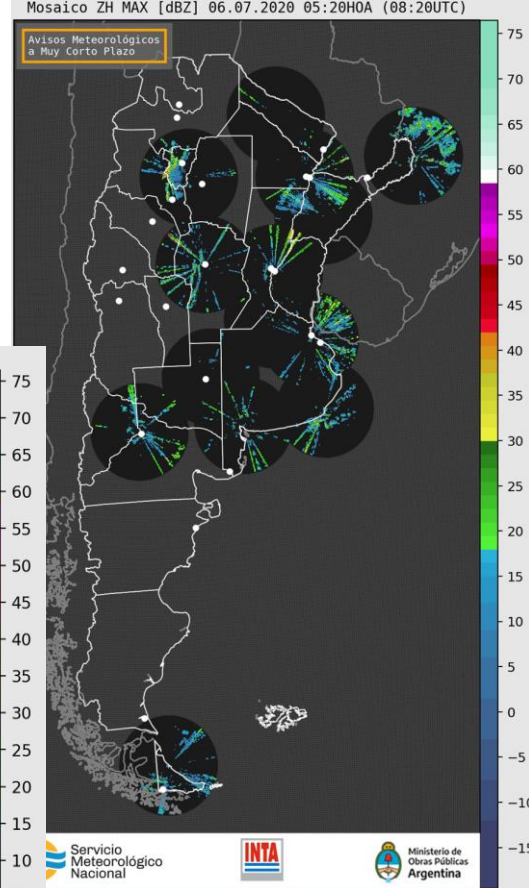
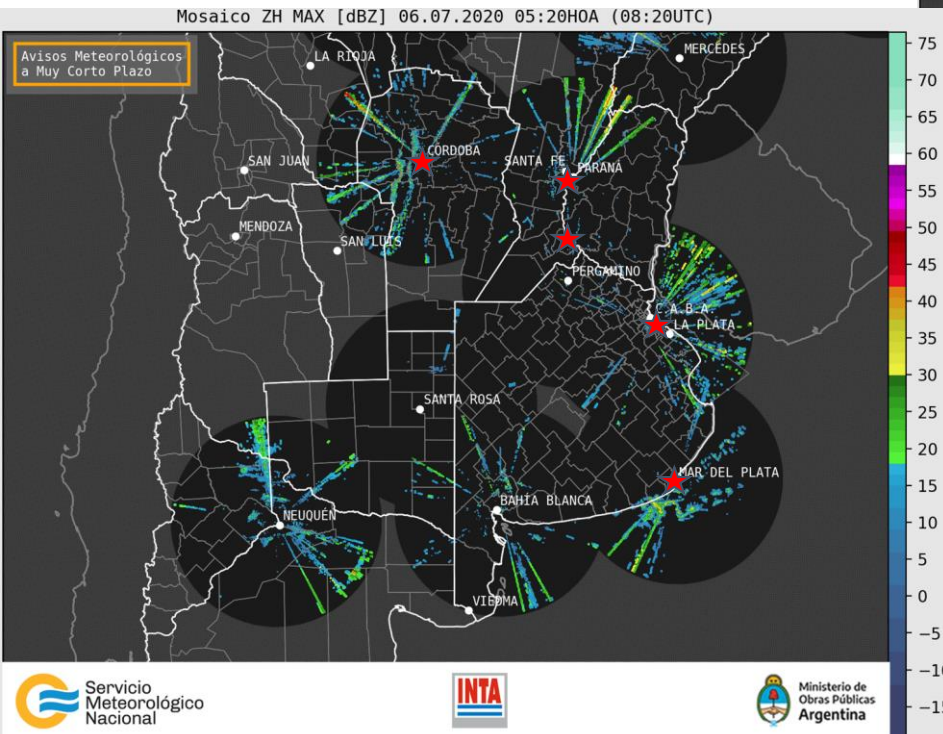
Mar del Plata-SINARAME ZH MAX [dBZ] 19.07.2020 15:01HOA (18:01UTC)



Avisos Meteorológicos a Muy Corto Plazo

Weather radars

- 14 C-Band Dual-Pol Weather surveillance Radars
- Total coverage area of 2.000.000 km² aprox.



Verification sources and process

Despite the fact that we issue warnings for the entire area covered by the fourteen radars, we only verify those that include the following regions:

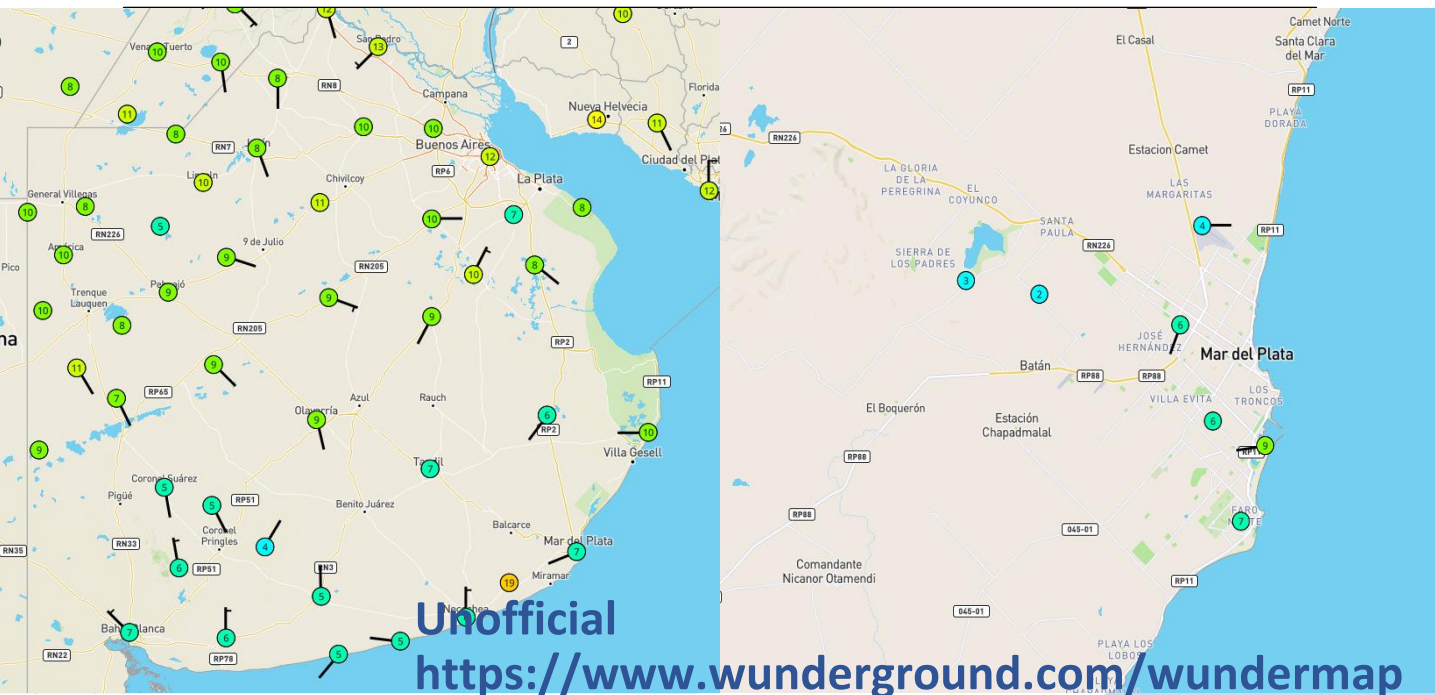
- Gran Buenos Aires - Gran La Plata (AMBA) - 13.285 km²
- Córdoba (CBA) - 576 km²
- Paraná - Santa Fé (PAR - SF) - 405 km²
- Mar del Plata (MDP) - 79,48 km²
- Rosario (ROS) - 589 km²

Verification sources and process

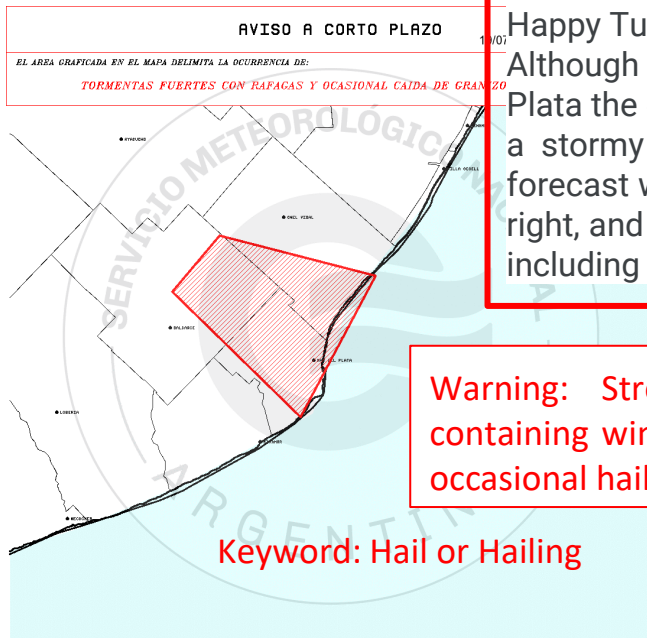


Regions with the highest population index in Argentina in the vicinity of a weather radar.

Official and unofficial weather station networks



Twitter reports



Happy Tuesday!
Although in Mar del Plata the entire week a stormy weather forecast was proven right, and on Sunday including Hail.

Warning: Strong storms containing wind gusts and occasional hail fall



Google advanced search



granizo OR granizó OR granizada OR granizando



T Télam

Fuerte caída de granizo sobre Santa Clara del Mar y Mar del ...

Una fuerte tormenta de granizo con caída de piedras de más de cinco centímetros se registró en la tarde de este domingo en la localidad balnearia de Santa ...

19 jul. 2020



La Capital La Capital de Mar del Plata

Impresionante caída de granizo en Mar del Plata y la zona

Imágenes y videos muestran el tamaño de las piedras que cayeron este domingo en la ciudad y la zona. Comentarios. Una feroz granizada cayó este domingo ...

19 jul. 2020

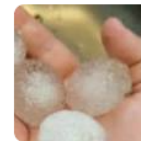


El Marplatense El Marplatense

Cayó "piedra" casi sin llover en Santa Clara del Mar

Si bien el granizo golpeó bien al norte de Mar del Plata y se agudizó en la zona de Santa Elena y Santa Clara del Mar, la probabilidad en Mar del Plata se ...

19 jul. 2020



Keyword: Hail or Hailing

Unofficial weather station networks. Example: Wundermap.

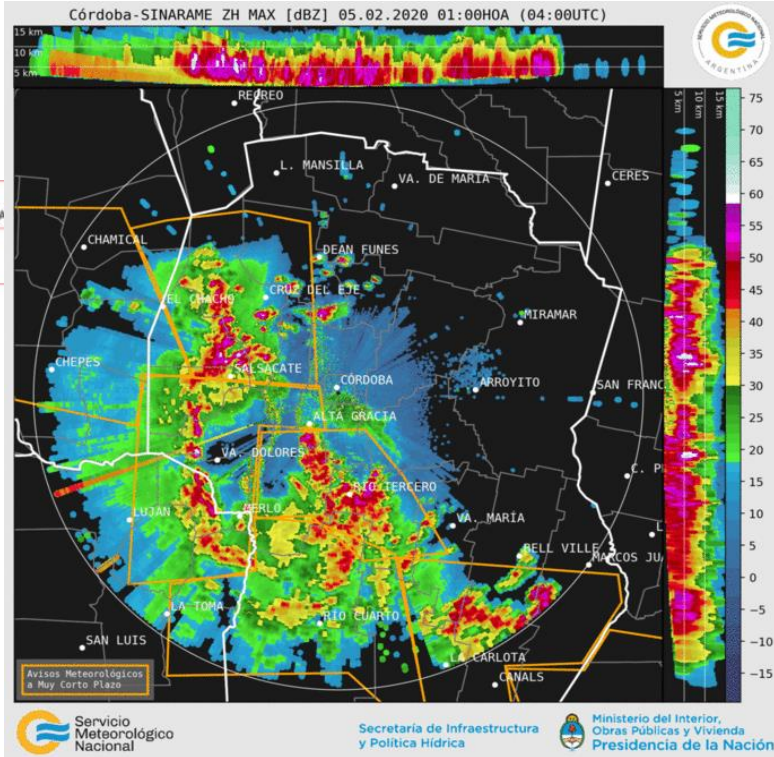
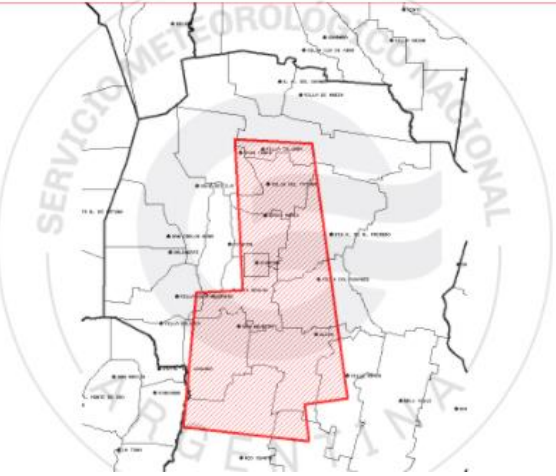
Warning: Strong storms with heavy rain, wind gust and hail fall

AVISO A CORTO PLAZO

05/02/2020 a las 02:16 HOA

EL AREA GRAFICADA EN EL MAPA DELIMITA LA OCURRENCIA DE:

TORMENTAS FUERTES CON LLUVIAS INTENSAS, RAFAGAS Y OCASIONAL CAIDA DE GRANIZO



Verification sources and process

Phenomenon	Main source of verification	Validation
Hail	Twitter reports	1 tweet including a picture of the hailstones, or at least two tweets without picture
	Local news using the advanced google search	At least one report on a local newspaper
Strong winds	Official SPECT messages	1 report is enough
	Unofficial Meteorological automated stations on Wundermap	At least two stations measuring winds higher than 60 km/h
	Local news using the advanced google search	1 report is enough
Heavy rain	Unofficial Meteorological automated stations on Wundermap	At least two close stations with accumulated precipitation higher than 20 mm in one hour
	Twitter reports	1 tweet including a video of the rainfall

Verification sources and process

Verification database

Nro ACP	Área	Fecha	Hora	Título	¿Hay reportes? 1 = sí hay reportes; 0 = no hay reportes	
569	CBA	16/02/2020	19:37:00	TORMENTAS FUERTES CON LLUVIAS INTENSAS	1	Se registran tasas de precipitación de en 30 minutos. Se emite SPECI a las. Hubo reportes de anegamientos: https://www.lavoz.com.ar/ciudadanos/-arboles-y-voladuras-de-techos-e
565	ROS	16/02/2020	17:56:00	TORMENTAS FUERTES CON RAFAGAS Y OCASIONAL CAIDA DE GRANIZO	1	A las 18:38 HOA Rosario Aerodrome rafagas de 70 km/h.
558	PAR-SF	16/02/2020	14:54:00	TORMENTAS FUERTES CON LLUVIAS INTENSAS Y RAFAGAS	1	Dos estaciones del departamento de I EMA acumuló 40 mm en 15 minutos,
522	MDP	13/02/2020	15:36:00	TORMENTAS FUERTES CON LLUVIAS INTENSAS	0	EMAs extraoficiales reportaron acumu (tasa promedio de 5 mm por hora) y r:

Verification results

Verification table

		# ACPs	Hits	False alarms	Misses	POD	TS	B	MR	FAR	SR
Enero-Febrero (2020) January-February	AMBA	30	20	10	0	1,00	0,67	1,50	0,00	0,33	0,67
	CBA	17	11	6	0	1,00	0,65	1,55	0,00	0,35	0,65
	PAR-SF	16	8	8	0	1,00	0,50	2,00	0,00	0,50	0,50
	MDP	13	5	8	0	1,00	0,38	2,60	0,00	0,62	0,38
	ROS	2	2	0	0	1,00	1,00	1,00	0,00	0,00	1,00
Marzo-Abril-Mayo (2020) March-April-May	AMBA	34	13	21	1	0,93	0,37	2,43	0,00	0,62	0,38
	CBA	9	2	7	1	0,67	0,20	3,00	0,07	0,78	0,22
	PAR-SF	16	5	11	0	1,00	0,31	3,20	0,00	0,69	0,31
	MDP	13	4	9	1	0,80	0,29	2,60	0,20	0,69	0,31
	ROS	10	4	6	1	0,80	0,36	2,00	0,20	0,60	0,40
Junio-Julio-Agosto (2020) June-July-August	AMBA	20	10	10	0	1,00	0,50	2,00	0,00	0,50	0,50
	CBA	-	-	-	-	-	-	-	-	-	-
	PAR-SF	4	2	2	0	1,00	0,50	2,00	0,00	0,50	0,50
	MDP	8	3	5	0	1,00	0,38	2,67	0,00	0,63	0,38
	ROS	1	0	1	0	#iDIV/0!	0,00	#iDIV/0!	#iDIV/0!	1,00	0,00

Absence of correct negatives

POD: Probability of detection

TS: Threat score

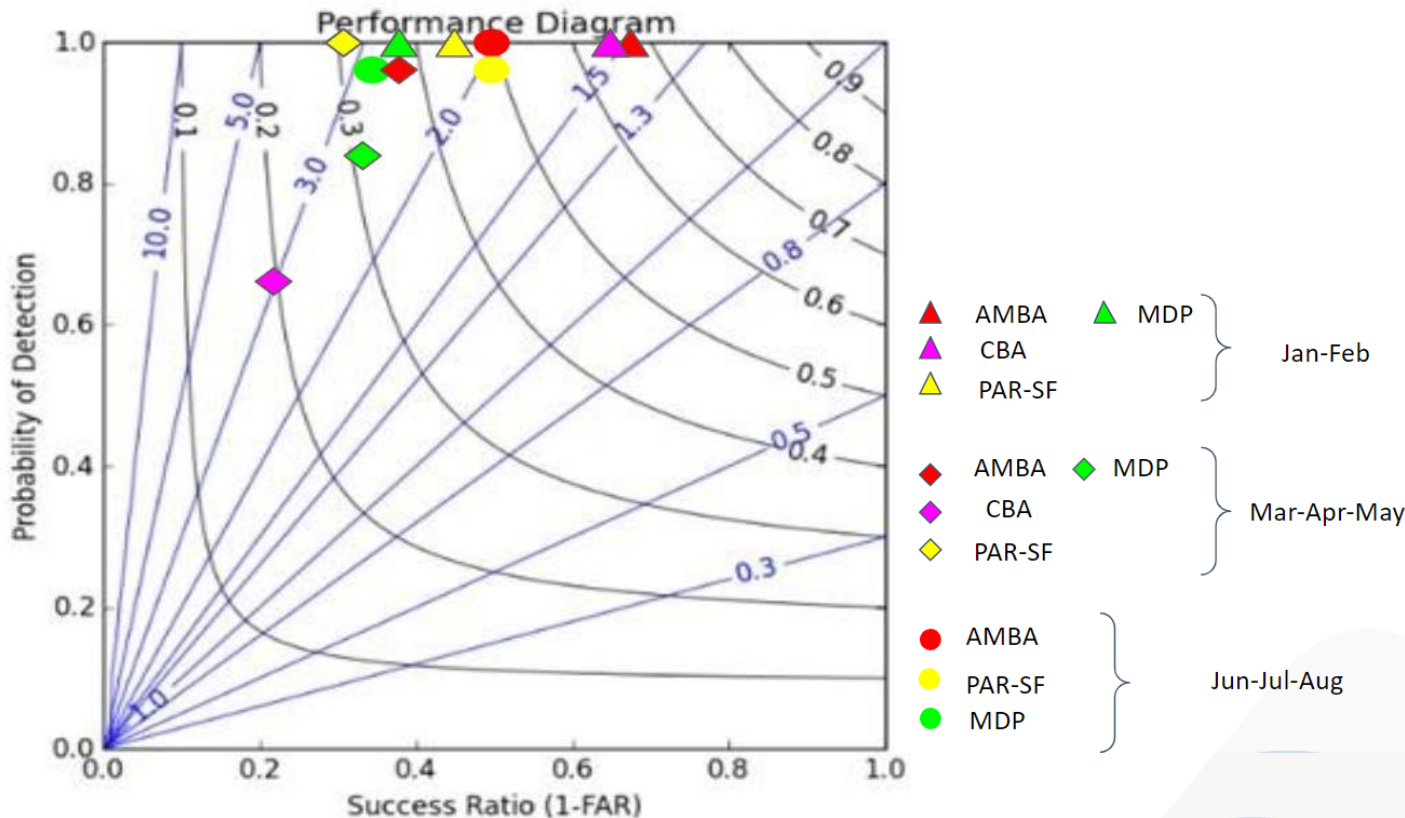
B: Bias index

MR: Miss rate

FAR: False alarm ratio

SR: Success ratio

Performance diagram (2020)



Roebber, P. J., 2009: Visualizing Multiple Measures of Forecast Quality. *Wea. Forecasting*, **24**, 601–608, <https://doi.org/10.1175/2008WAF2222159.1>.

- We issue many short-term warnings with false alarms. That's why in almost all cases we have high values of probability of detection and not too high success ratio values.
- Our tendency to have high values of POD is a consequence of the public reaction to misses. People do not like surprises at all, and hence we are being nudged by the public.
- It's important to keep in mind that false alarms could be inflated by our too coarse verification network, especially outside cities.

Next steps

Short term steps will be:

- Automated social network data mining
- Ongoing staff training
- Develop training modules and better issuing criteria to enhance nowcasting products by studying the verification process
- Finding a trade-off between hits and false alarms that better serves the need of users

And for long term:

- Expansion of the automatic station network
- Incorporation of new technology
- Broaden verification areas



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Ministerio de Defensa
Presidencia de la Nación

2020 | Año del General Manuel Belgrano