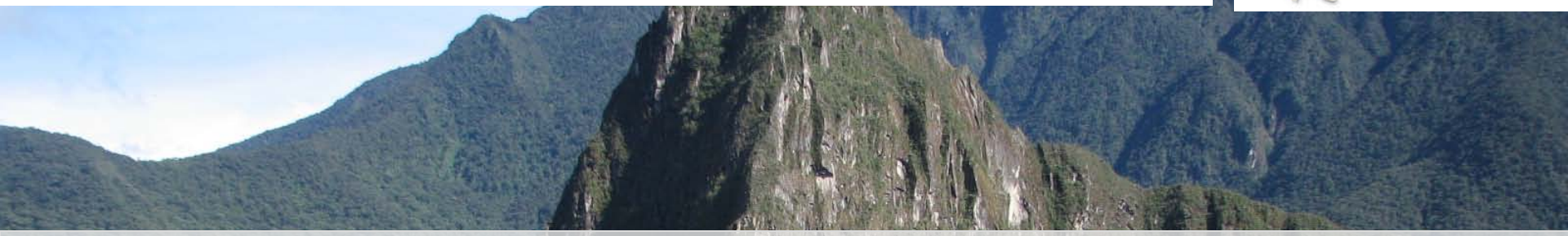
PERÚ | Ministerio del Ambiente | Servicio Nacional de Meteorología e Hidrología del Perú - SENAMHI

Senamhi



First steps in Hydroclimatological Services in Peru

Waldo Lavado Casimiro

WCRP Conference for Latin America and the Caribbean: Developing, linking and applying climate knowledge

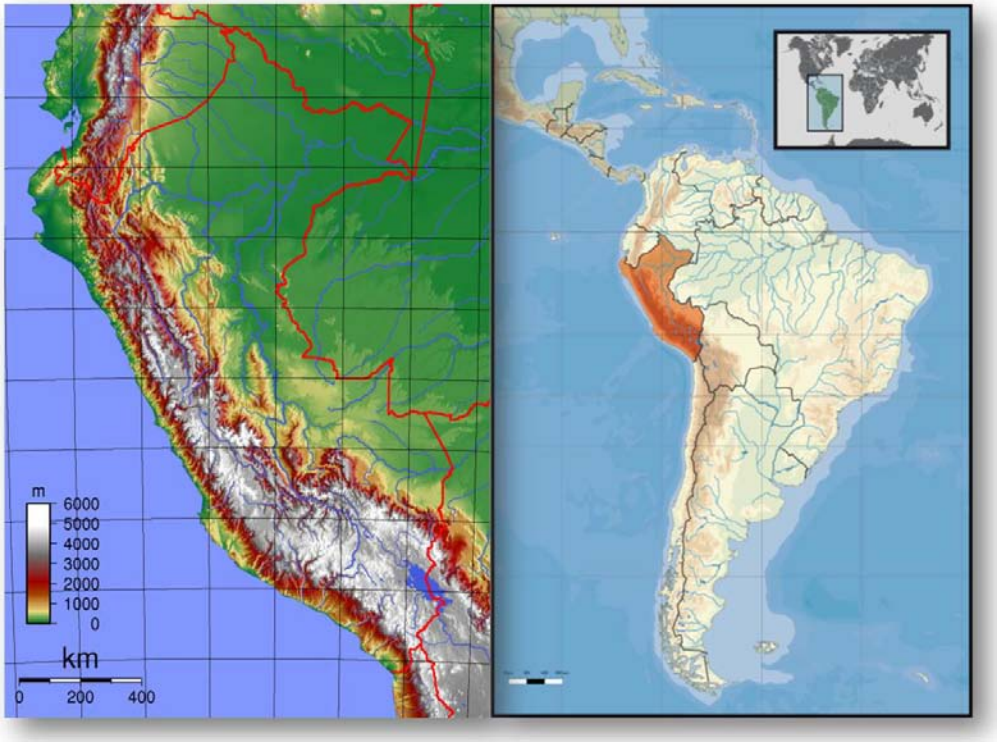
Montevideo, Uruguay

March 17-21, 2014

AGENDA

- INTRODUCTION
- HYDROLOGICAL INFORMATION
- HYDROLOGICAL SERVICES AND PRODUCTS
- SENAMHI PERSPECTIVES

PERU



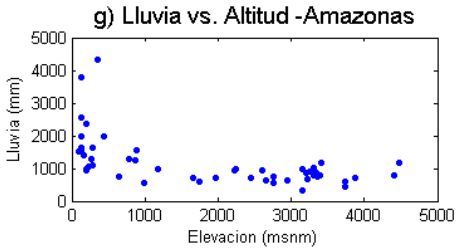
Source: http://geografia.laguia2000.com et http://fr.wikipedia.org/wiki/fichier:south_america_location_per.png

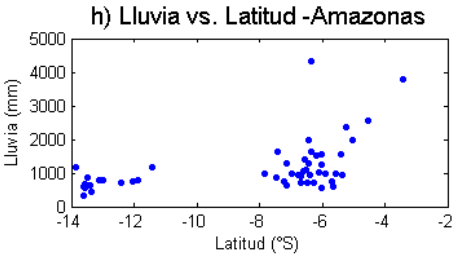
Surface : 1 285 220 Km^2

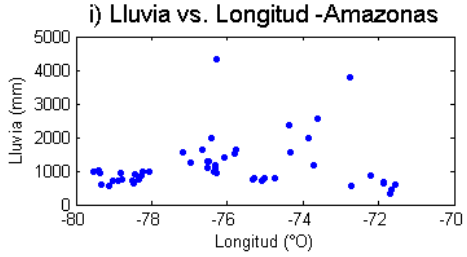
27 climate zones in Peru (SENAMHI,2005)

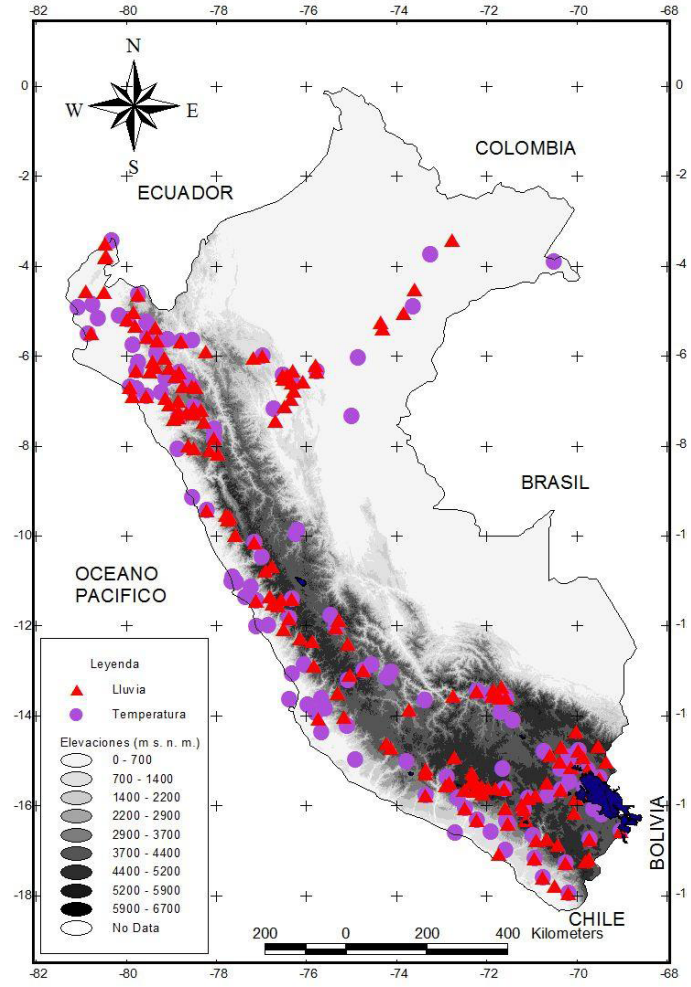
Drainage network:
Pacific, Titicaca Lake and Amazonas

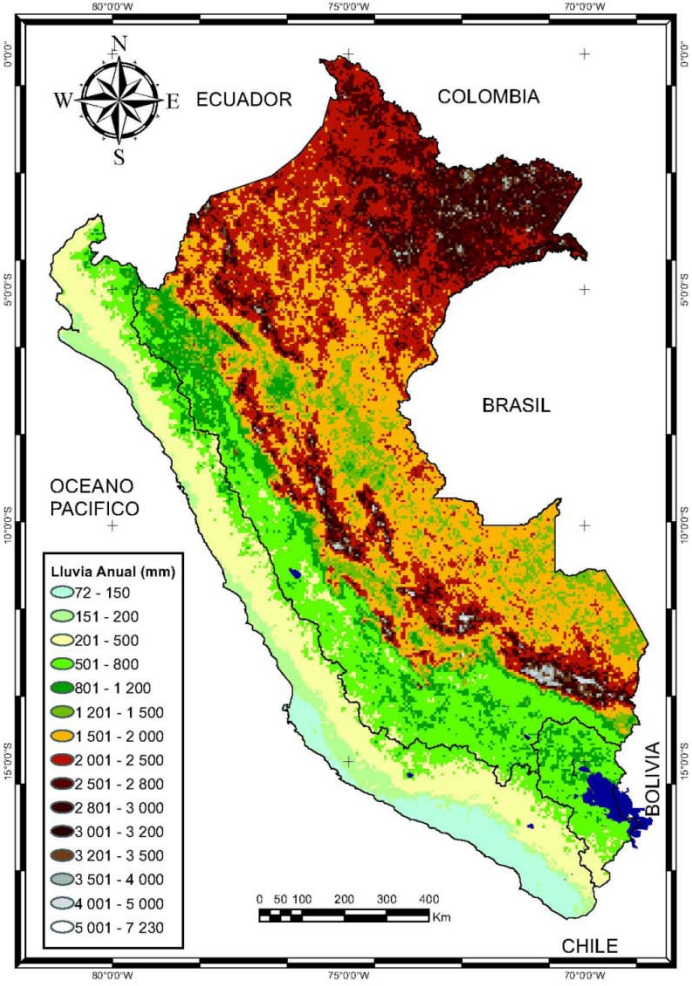
RAINFALL IN PERU (1970-1999)





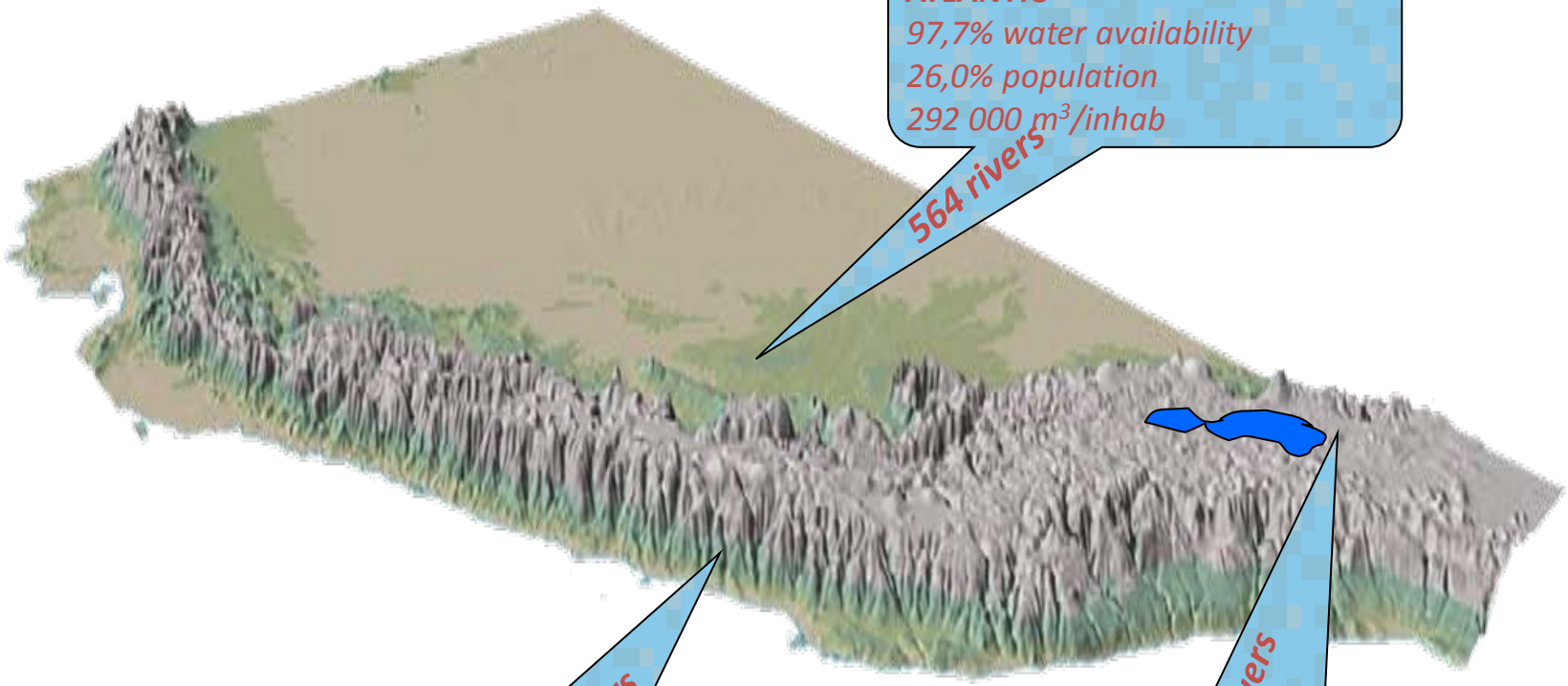






WCRP Waldo Lavac

PERUVIAN DRAINAGES

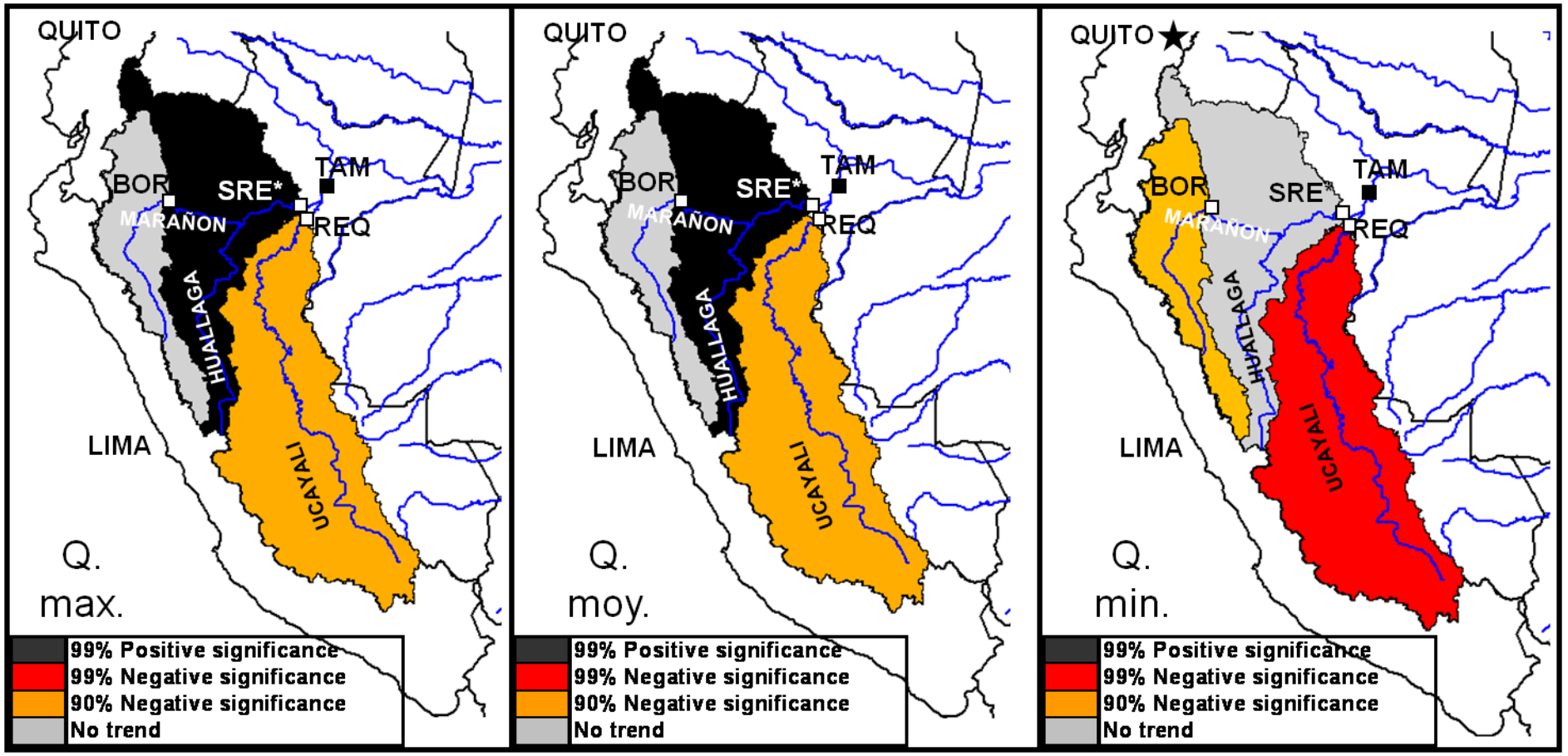


ATLANTIC
97,7% water availability
26,0% population
292 000 m^3/inhab
564 rivers

PACIFIC
1,8 % water availability
70 % population
2 027 m^3/inhab
381 rivers

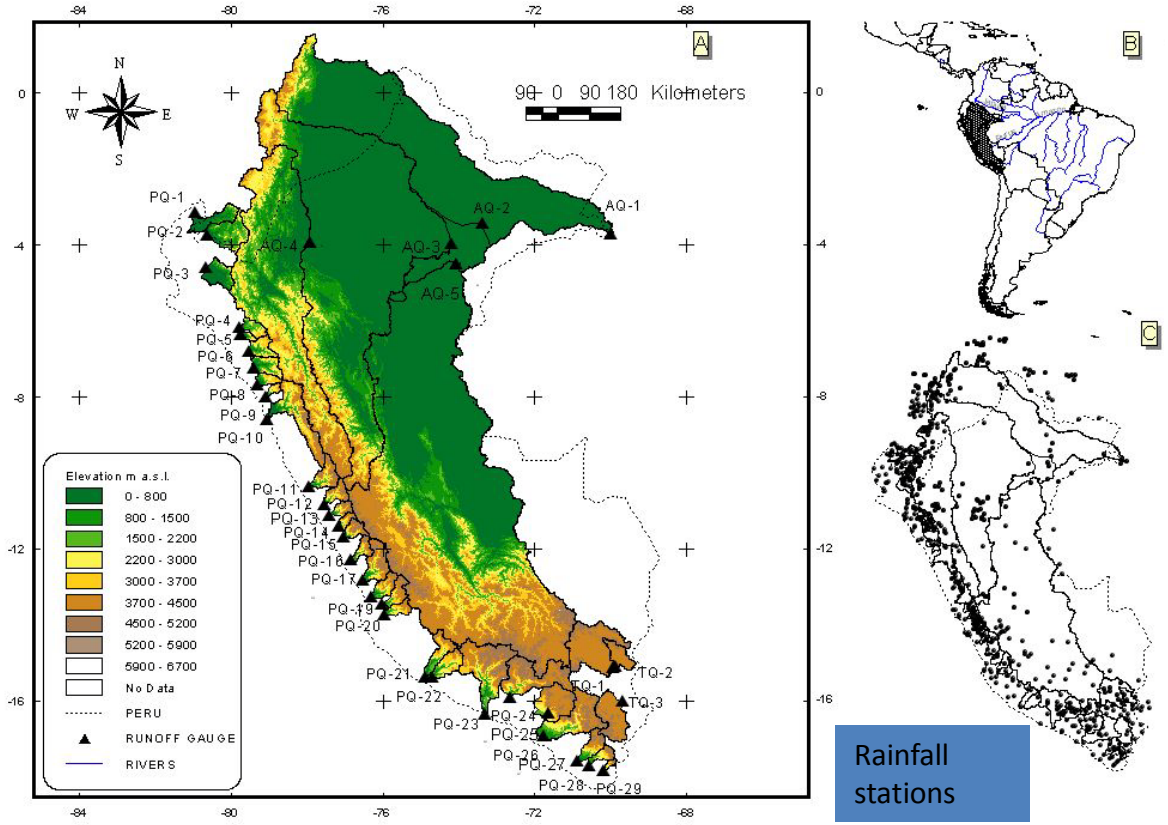
TITICACA
0,5% water availability
4,0% population
9 715 m^3/inhab
62 rivers

DISCHARGE TRENDS (1990-2005)



Espinoza et al. (2010)

Discharge trends

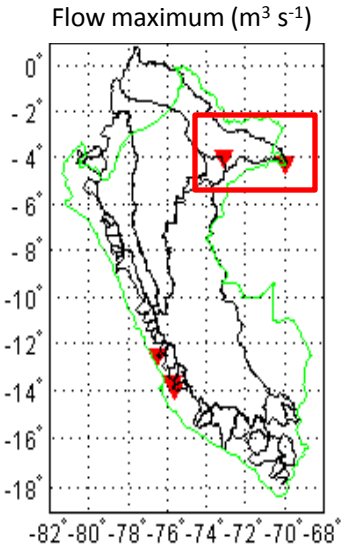


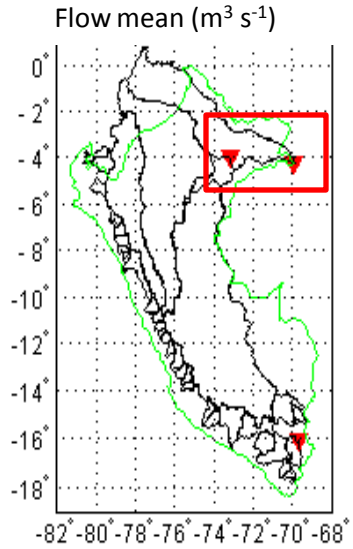
Rainfall stations

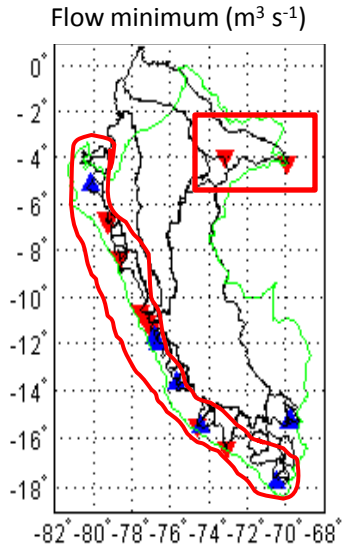
29 Pacific, 3 Titicaca y 2 (5 for rainfall) in the amazonas basin.

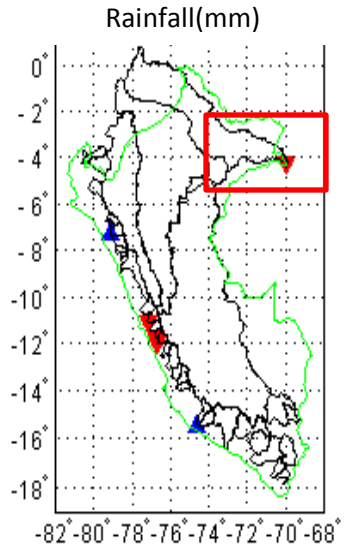
A basin-scale trends in rainfall and runoff in Peru (1969-2004): Pacific, Titicaca and Amazonas drainage.

Lavado et al. (2012)









positive trend
negative trend

159 Hydrological Units

14 Water Autorithies Administratives

Source: National Agency of Water

State of the water information in the 159 hydrological units in Peru

Green: There are information (40)

Red: There are no information (11

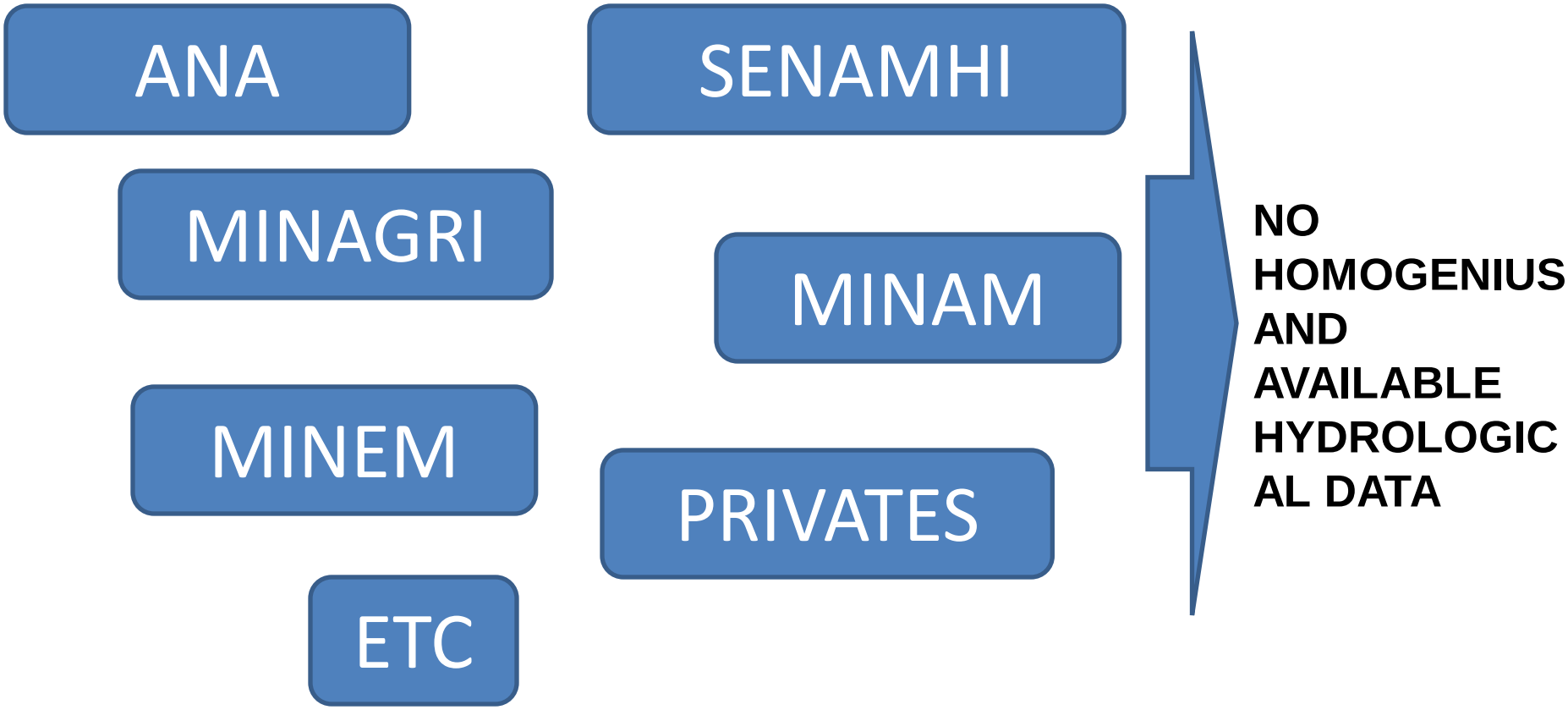
Violet: Mini ts

NO HYDROLOGICAL DATA → NO RESEARCH → NO HYDROLOGICAL SERVICES

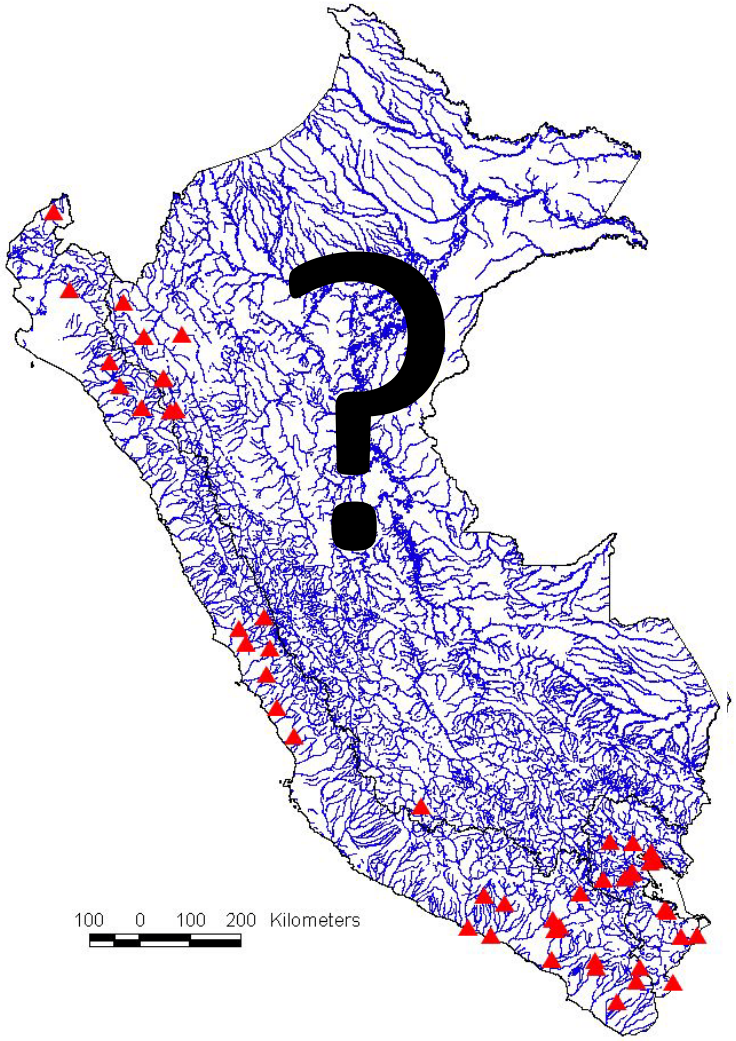
Source: National Agency of Water and Energy and Mining Minister publied in La Republica (2014)

FIRST PROBLEM

Many institutions working for Water Resources monitoring



SENAMHI Hydrological network



AMAZONAS	
Total	69
PACIFIC	
Total	53
TITICACA	
Total	19

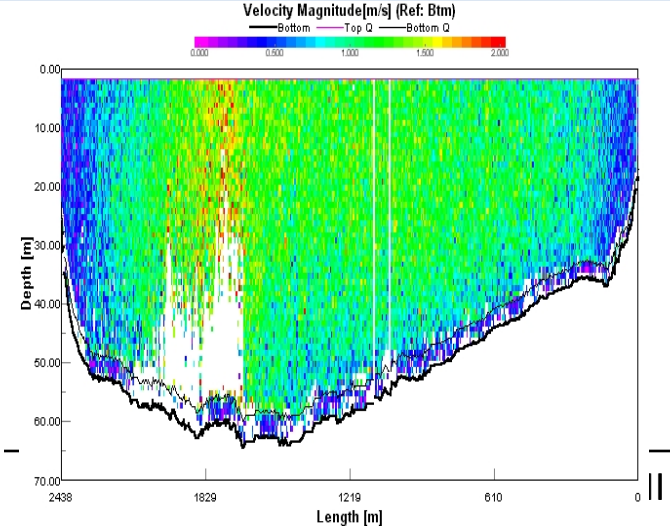
AMAZONAS	
Discharges	***8***
Levels	***61***
PACIFIC	
Discharges	***25***
Levels	***28***
TITICACA	
Discharges	***16***
Levels	***3***

Discharge Mission (2002: Accord IRD-SENAMHI)

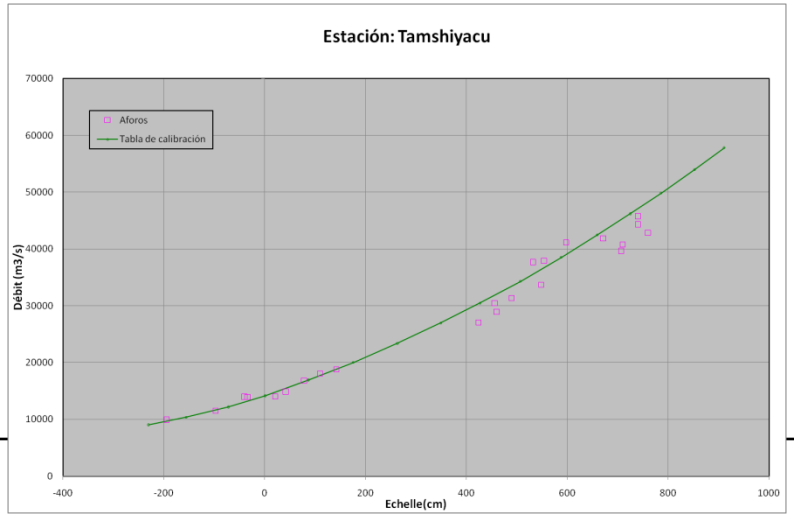
Level Scale

Using ADCP

Discharge measurement

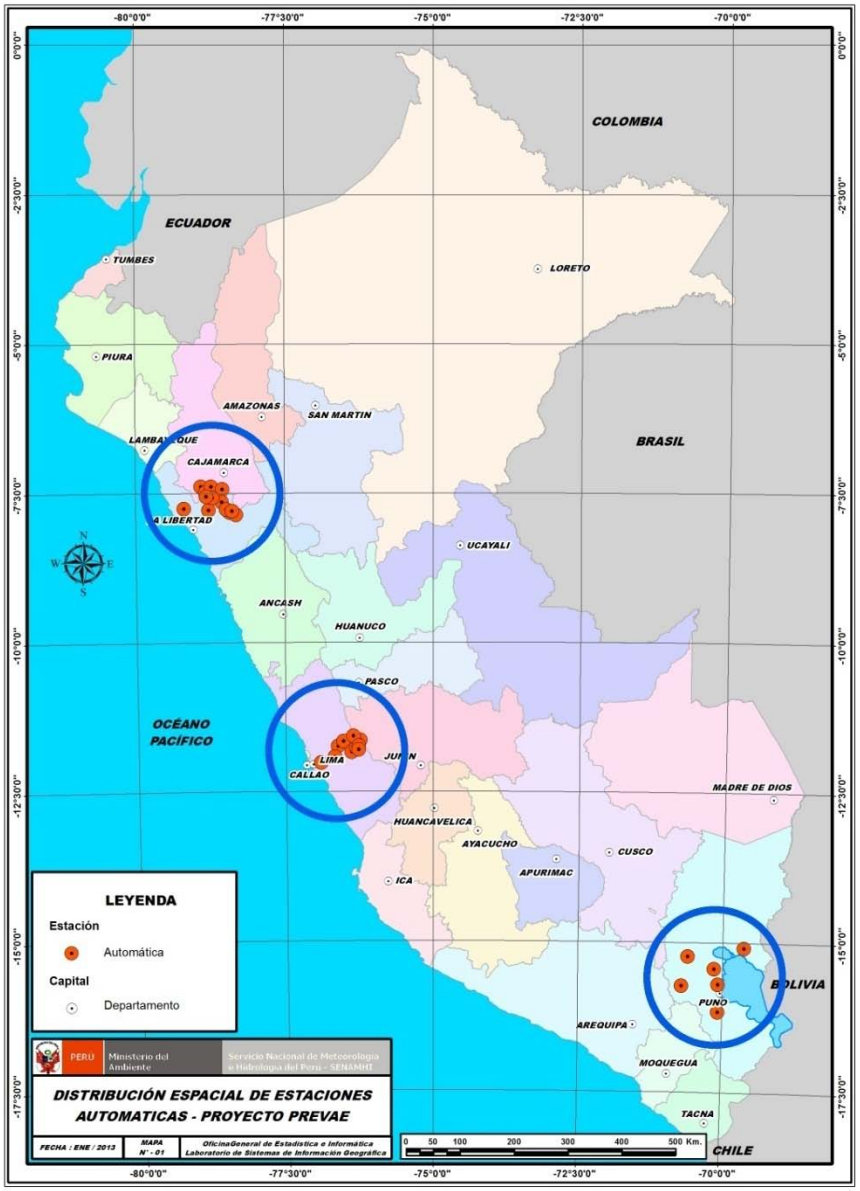


Rating curve



HYBAM Projet

Discharge stations in the Amazonas basin



PROGRAMME BUDGET VULNERABILITY REDUCTION AND EMERGENCY CARE

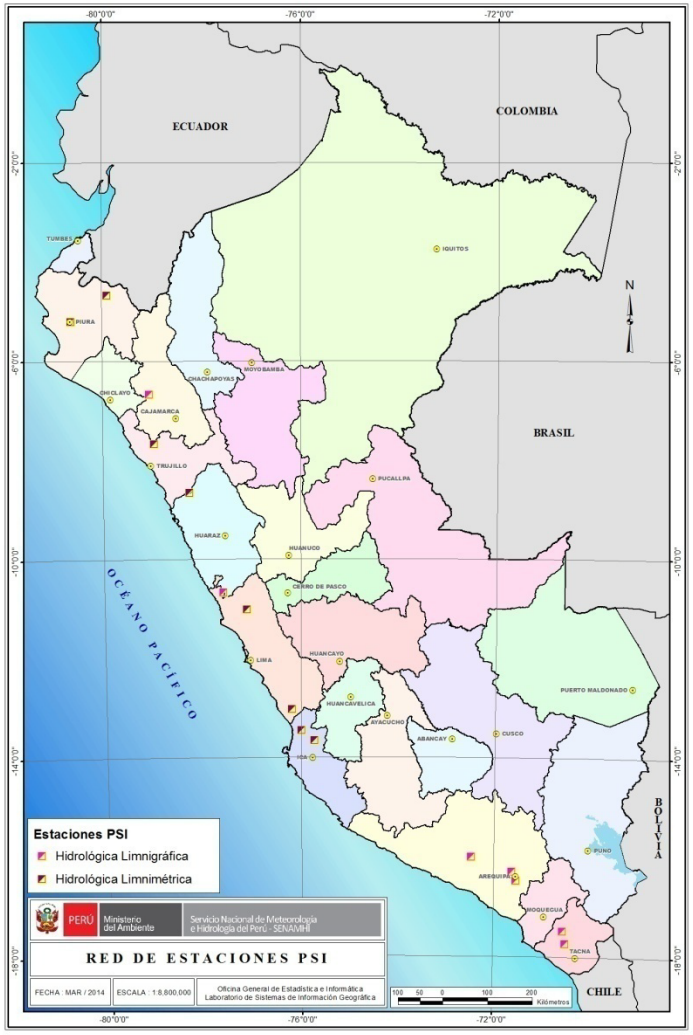
18 Meteorological stations and 11 Hydrological stations

Support for prevention of hydrometeorological risk disasters

National Agency of Water (BID-WB financing) Modernization of water resources management project

78 automatic stations:
36 are EHA, 6 are EHMA, and 36 are EMA.

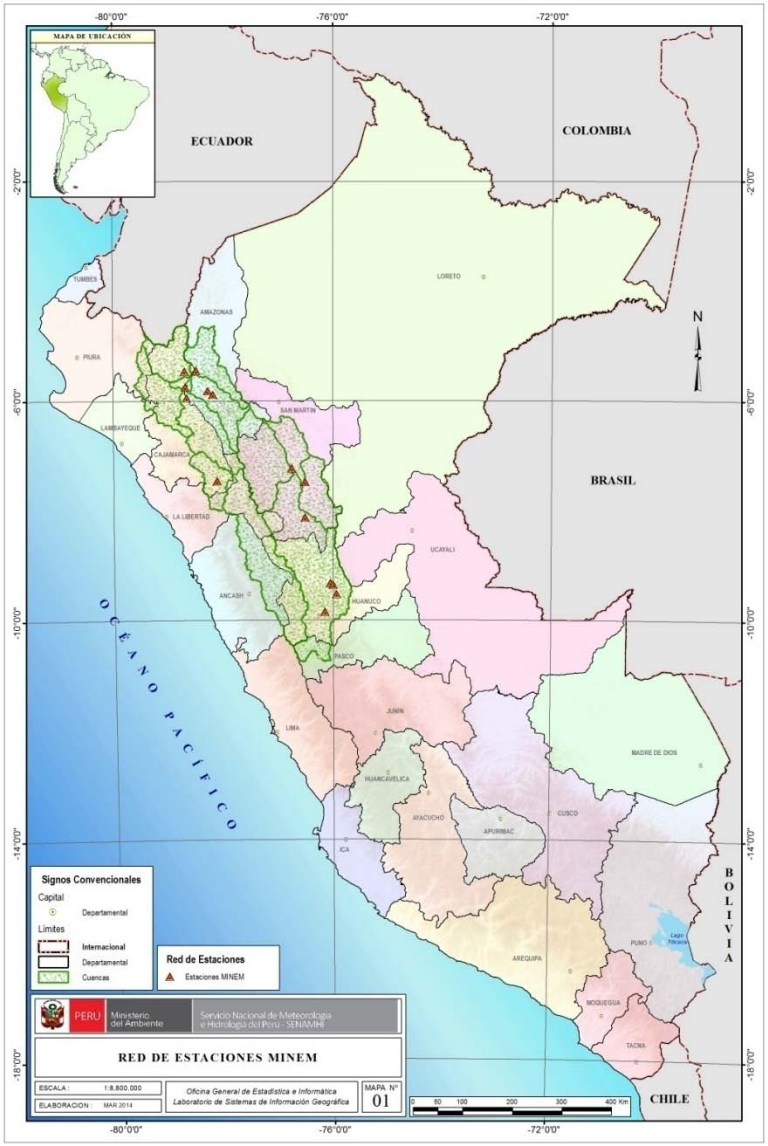
Support for Water Resources Management



Irrigation Subsector program

15 Hydrological automatic stations:

Support for Water Resources Management



Ministry of Energy and Mines

13 Hydrological automatic stations:

Support for Assesemnt of Hydropower potential

PROGRAMME BUDGET VULNERABILITY REDUCTION AND EMERGENCY CARE

PROGRAMA PRESUPUESTAL
REDUCCION DE VULNERABILIDAD Y ATENCION DE EMERGENCIA

El SENAMHI de acuerdo a sus funciones establecidas, cumple una labor técnica científica en apoyo a GESTION DE RIESGO DE DESASTRE, brindando información sobre el comportamiento hidrometeorológico que se registra en el país con la finalidad que las autoridades en los tres niveles de gobierno y ciudadanía en general adopten medidas de prevención oportuna. Como parte de este proceso y como iniciativa del Ministerio de Economía y Finanzas, se participa en el Programa Presupuestal Multisectorial 068 Reducción de Vulnerabilidad y Atención de Emergencias.

PROBLEMA ESPECÍFICO IDENTIFICADO POR EL PROGRAMA PRESUPUESTAL

"Población y sus medios de vida vulnerables ante impacto de amenazas con secuelas de desastre".

RESULTADO ESPECIFICO

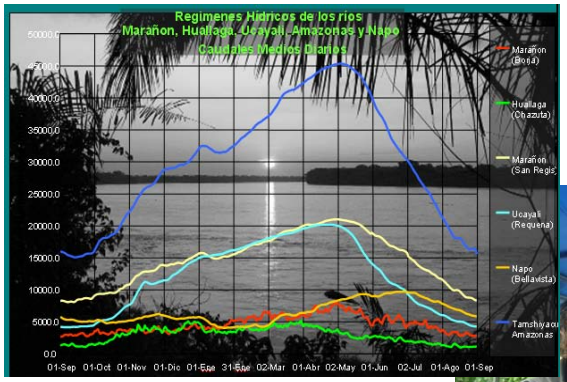
Reducción de Vulnerabilidad de la población y sus medios de vida ante la ocurrencia de Amenazas

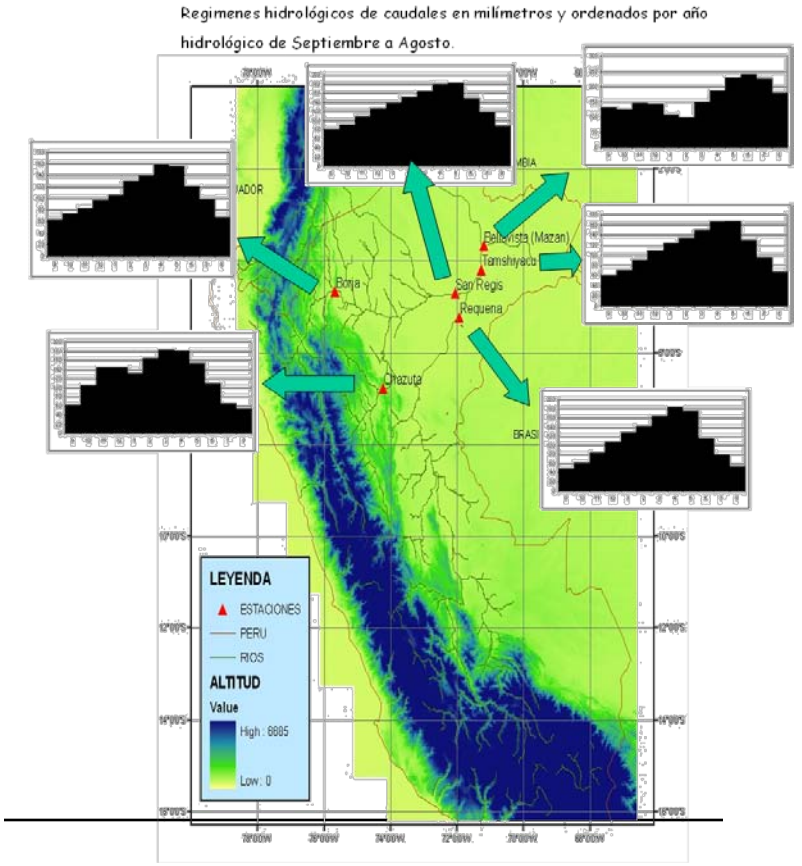
PRODUCTO: ZONAS GEOGRÁFICAS MONITOREADAS Y ALERTADAS ANTE PELIGROS HIDROMETEOROLÓGICOS

El producto consiste en brindar servicios de monitoreo, pronósticos y alertas hidrometeorológicas en forma permanente, así como estudios de caracterización climática, hidrológica y determinación de umbrales de las variables meteorológicas e hidrológicas a las autoridades locales a través de sus centros de operaciones de emergencias dentro del ámbito de las cuencas de Chicama, Rímac y Provincias de Puno y San Román. Estos servicio serán entregados via correos electrónicos, pagina Web del SENAMHI y/o fax por parte de las Direcciones Regionales del SENAMHI (Cajamarca, Lima y Puno) para lo cual se realizarán talleres sobre el uso de la información hidrometeorológica a las autoridades, medios de comunicación y público en general.

HYDROLOGICAL MONITORING OF THE AMAZON BASIN

SENAMHI PRODUCE EVERY THREE MONTHS ONE BULLETIN OF THE HYDROLOGY OF THE AMAZON BASIN





Droughts: Warmer than normal conditions in the tropical North Atlantic (April-August). E.g. 2010, 2005, 1995

Espinoza et al, 2011,2012,2013

Floods: Colder than normal conditions in the central equatorial Pacific (December to March). E.g. 2012, 2011, 1999

Significant historical correlations between these oceanic regions and flows

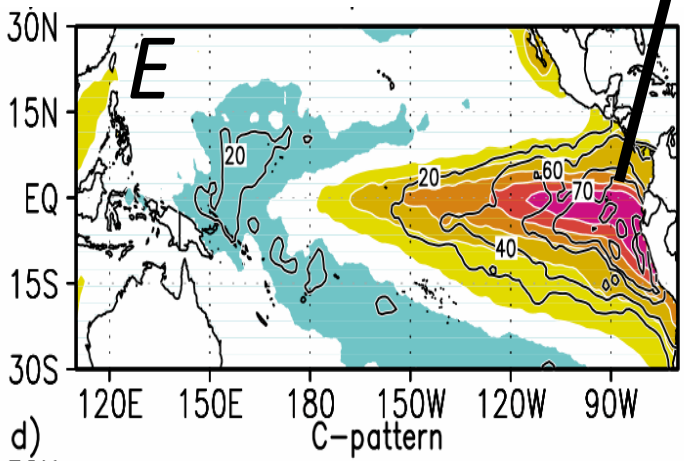
Positive correlation with *E*

Negative correlation with C

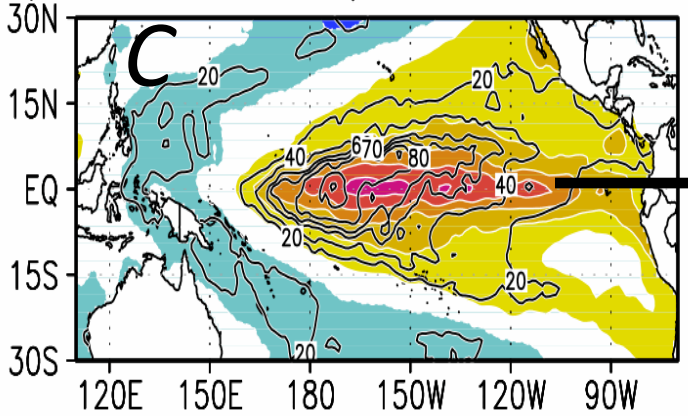
Warming in the coast favors more rainfall in the low region

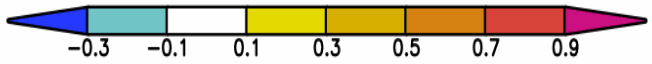
Drainage division

Correlation between annual rainfall with ENSO index E an C



d)

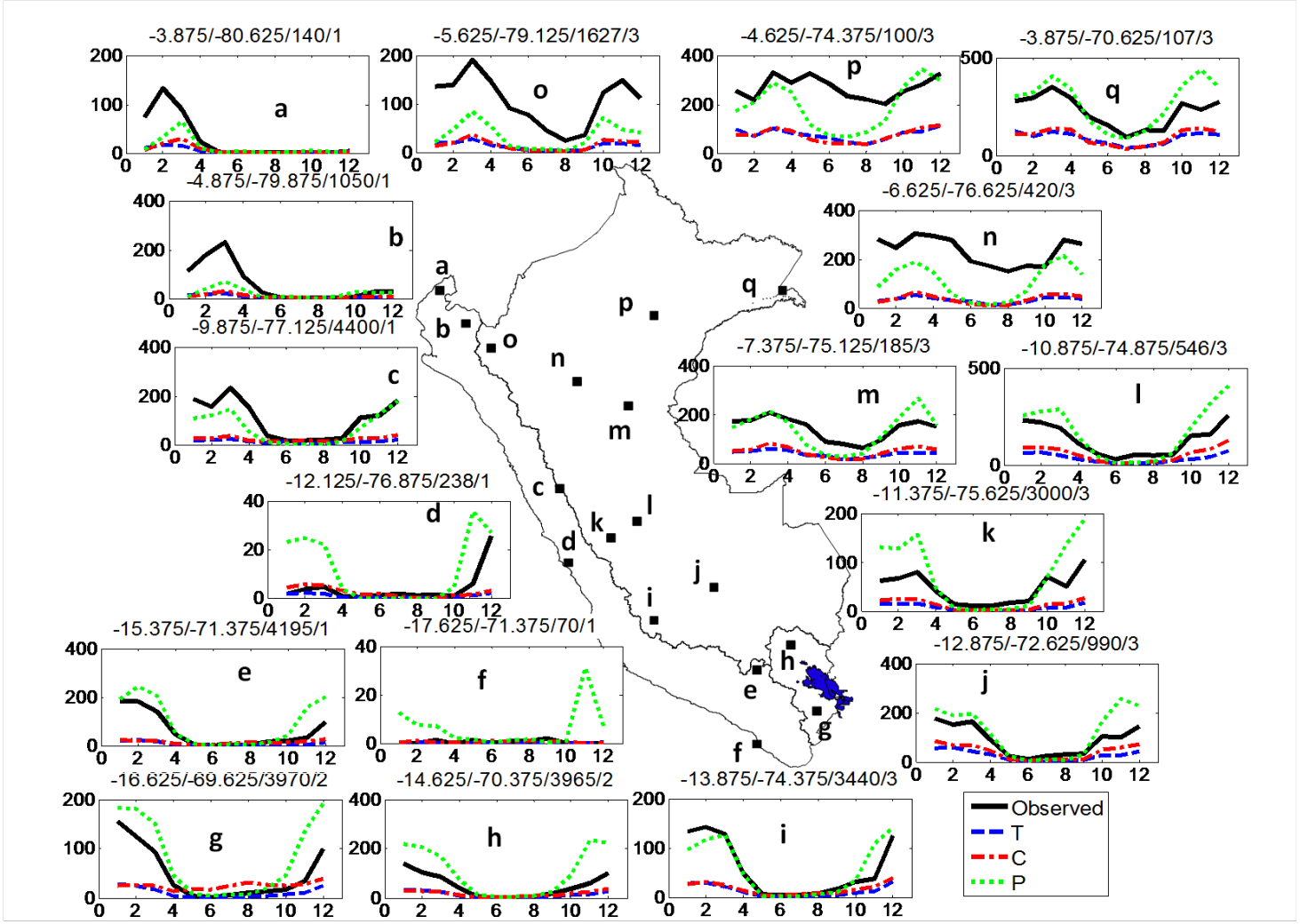




Warming in the center supress rainfall in the high mountain

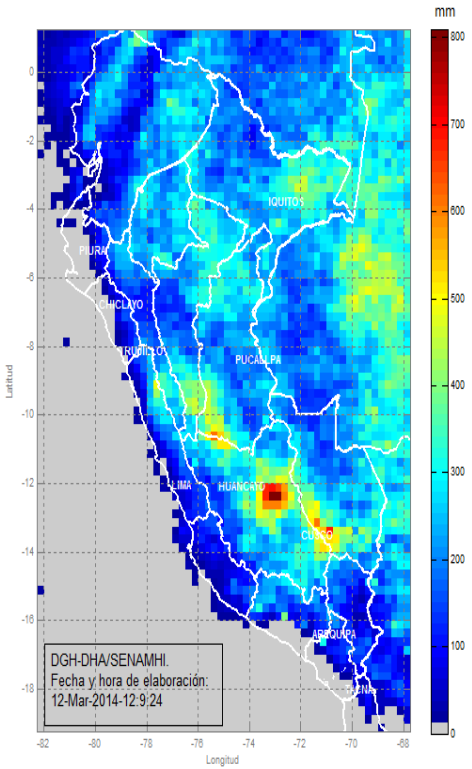
Lavado & Espinoza, 2013

Validation of satellite rainfall



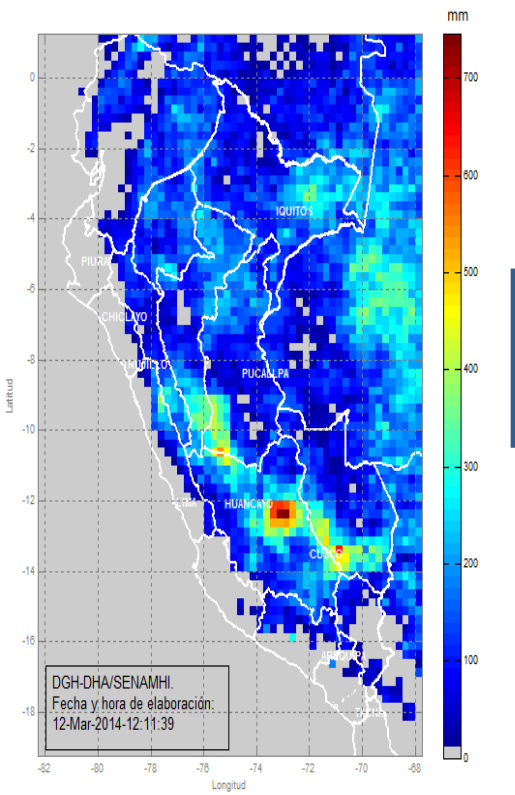
WATER BALANCE MONITORING MONITORING
(Using Remote Sensing)

PRECIPITACIÓN TOTAL ESTIMADA POR EL TRMM 3B42 RT (ACUMULADO DE LOS ÚLTIMOS 30 DÍAS)



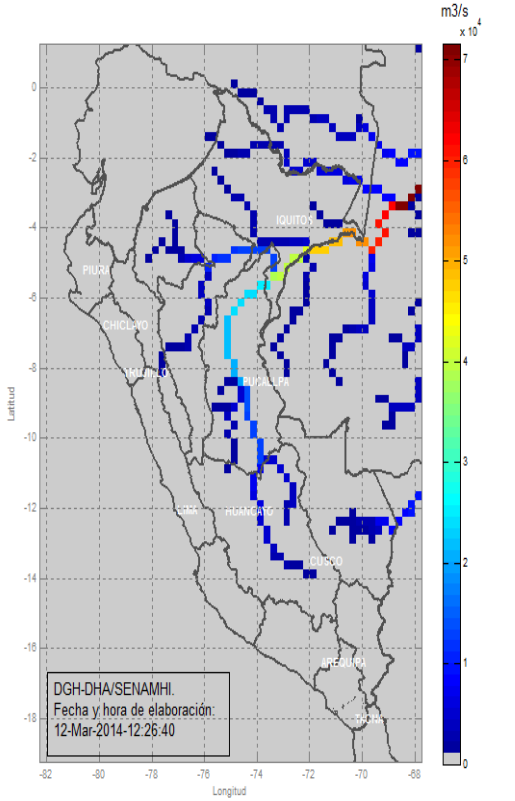
Mapa de Precipitación estimada por satélite TRMM-producto 3B42 RT
Fuente: trmmopen.gsfc.nasa.gov
Observación: Producto experimental en proceso de validación.

BALANCE HÍDRICO ESTIMADO EN BASE A INFORMACIÓN POR SATÉLITE (ÚLTIMOS 30 DÍAS)



Mapa de Balance Hídrico estimado por satélite TRMM-producto 3B42 RT y Evapotranspiración.
Fuente de Precipitación TRMM: trmmopen.gsfc.nasa.gov
Fuente Evapotranspiración: FEWS NET,http://earlywarning.usgs.gov/fews/global
Observación: Producto experimental en proceso de validación.

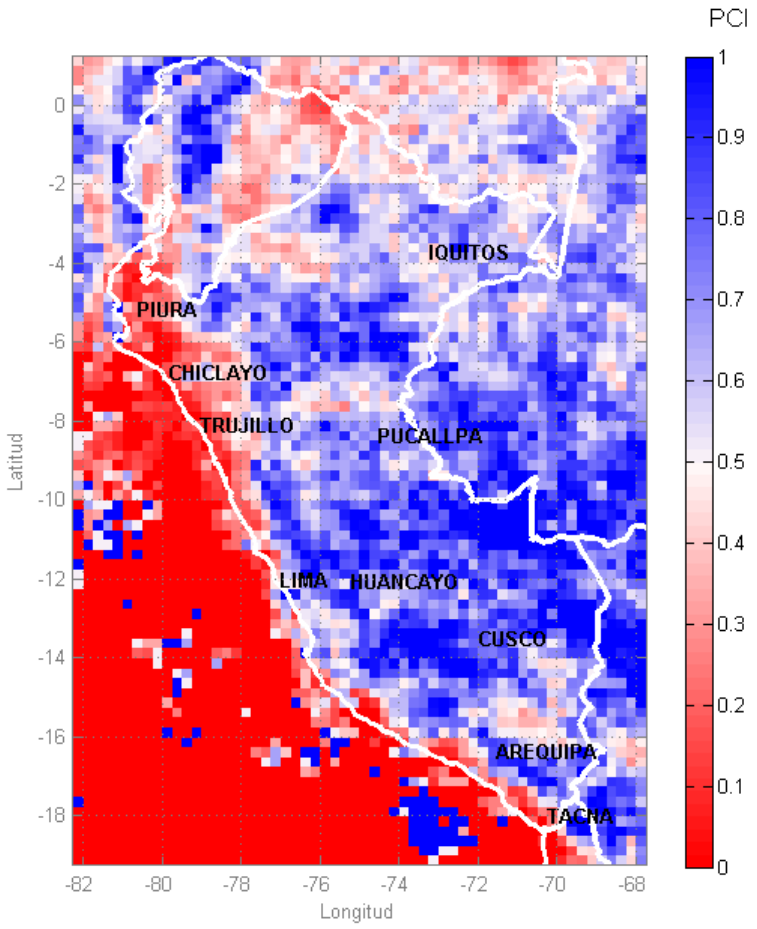
MAPA DE ESCORRENTÍA EN BASE A ESTIMACIÓN POR SATÉLITE (PROMEDIO ÚLTIMOS 30 DÍAS)



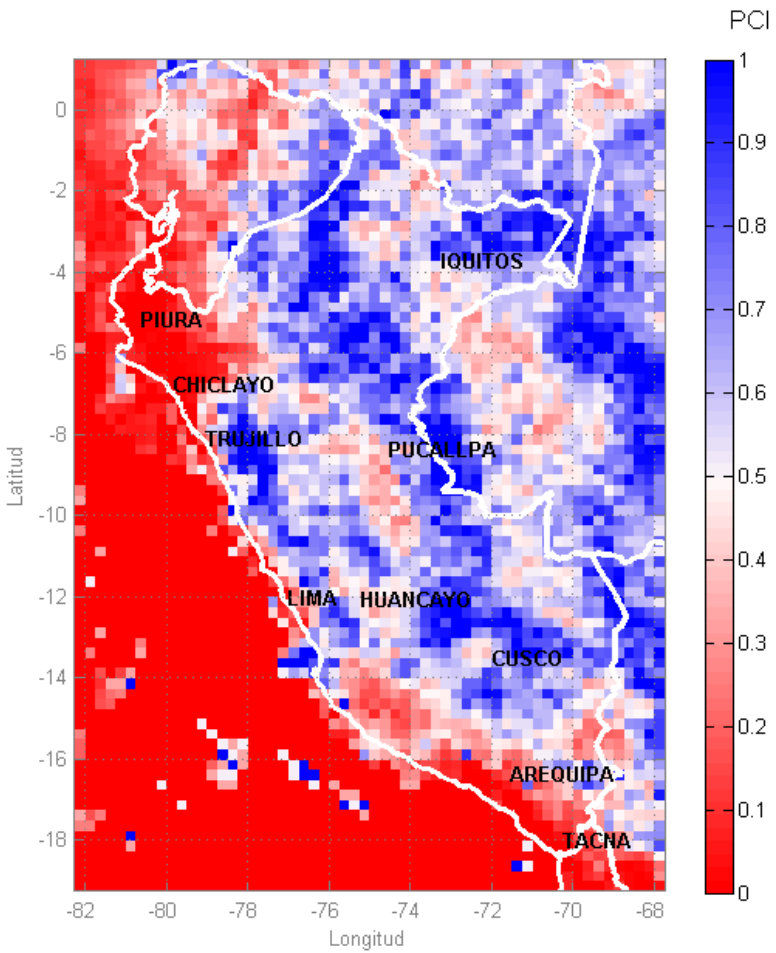
Mapa de Escurrimiento estimado por satélite TRMM-producto 3B42 RT y Evapotranspiración.
Fuente de Precipitación TRMM: trmmopen.gsfc.nasa.gov
Fuente Evapotranspiración: FEWS NET, http://earlywarning.usgs.gov/fews/global
Observación: Producto experimental en proceso de validación.

DROUGHT MONITORING (Using Remote Sensing)

PCI-Enero 2014



PCI-Febrero 2014



PROBLEM

"shortage of quality products and services at the disposal of the State for decision making"

CLIMANDES

provide the country with a sufficient range of climate services and products the public can use for informed decision-making.

Increase the capacity in the West LA to improve Climate Services

MODULE 1
Establish a Regional Training Center (RTC) to train professionals specialized in meteorology and climatology

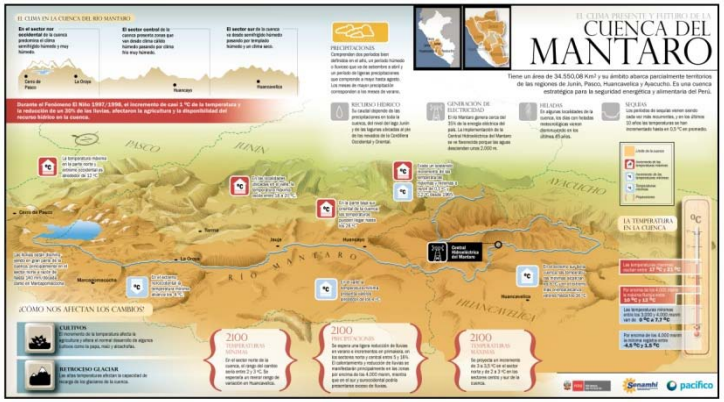
MODULE 2
Ensure public institutions adequately use climatological information in decision-making (GFCS Twinning)

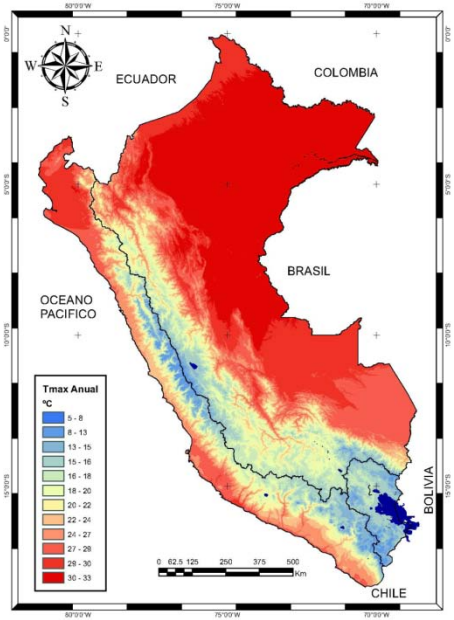
Activities of Module 1

- Provide specialization and training in meteorology and climatology to undergraduate students and graduate students.
- Strengthening institutional capacity for the development of education and training in meteorology and climatology for students, teachers (CRF) and SENAMHI's forecaster.
- Assist exchange of teachers and students for the transfer of knowledge and experience.
- Training in applied meteorology including Basic Education to teachers of Andean rural areas.

Activities of Module 2

- Identify climate services according to the demand of the state and private actors.
- Implement climate services in pilot areas (Cusco and Junín).
- Build a communication network between the SENAMHI and decision makers (public and private sector).
- Develop a diffusion system of climate information to decision makers of the public and private sector.





SENAMHI NEW STRATEGIC PLAN (2013-2015)

The Peruvian society takes appropriate decisions based on the weather, water and climate information for sustainable development

SENAMHI MISSION (2013-2015)

provide reliable and timely products and services meteorological, hydrological and climate

i) Disaster Risk, ii) Economic Development, iii) Climate, Water and Climate Change and iv) Environmental Quality.

CONCLUSIONS

We need improve hydrological monitoring (stations)

Together with other institutions (public and privates)

DATA = RESEARCH

IMPROVE HYDROLOGICAL SERVICES

Together with decision makers include journalist, improve diffusion

IMPROVE HUMAN RESOURCES IN HYDROLOGY

SENAMHI

WMO - GFCS


THANKS
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