TRANSLATION DIFFERENCES AND PRAGMATICS-BASED MT

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Abstract: This paper examines differences between two professional translations into English of the same Spanish newspaper article. Among other explanations for these differences, such as outright errors and free variation, we find a significant number of differences that can be explained on the basis of differing beliefs on the part of the translators about the subject matter. In particular, we attribute translation differences to differing beliefs about the probability of future events and of rational or irrational behavior in response to such probability. We discuss the requirements for a pragmatics-based model of translation that would account for these differences.

1. Introduction

For the past two years, we have been motivating a pragmatics-based approach to Machine Translation. We have tried to show that the next stage of Symbolic MT is to take the current state-of-the-art KBMT systems and embed them within a pragmatic framework which includes:

- nested beliefs spaces representing the differing beliefs of both the participants in the translation process and participants in the events described in the text,

- default reasoning about these events and participants to produce and compare possible interpretations which make a coherent whole of all the clues in the text and the context, and

- generation based on the most coherent interpretation, taking into account the beliefs of the target audience.

We claim that translation (and therefore machine translation) is based on interpretation rather than meaning (that is, on an inferred coherent understanding of the intent of the author, rather than on a propositional content expressed by the text). Furthermore, the translation task itself is then defined in terms of re-creating that interpretation within the belief space of the target language audience.

Methodologically, we have been examining multiple translations of the same text for evidence that justifies the above premises (Farwell & Helmreich, 1993, 1995, 1996). In each of these papers, we have selected and analyzed particular examples which illustrate aspects of this approach to translation.

In this paper, we continue this process, this time by looking at translation variants in an entire text. This approach also turns out to shed some interesting light on the recent ARPA MT evaluation methodology. Section 2 summarizes the results. Section 3 describes our methodology. Section 4 discusses the results in detail. Section 5 sets forth our approach to understanding some of the more significant translation variants, and Section 6 discusses some implications for machine translation and for MT evaluation.

2. Thesis

If translations are governed by interpretations of the source language document, then it would be reasonable to expect to find evidence of this in examining translation variants throughout a complete text. In the text examined, we find clear evidence that about 45% of the translation variants can be ascribed to differences in the two translators' beliefs. Moreover, a significant portion of these differences can be related to different overall interpretations of the author's intent. These two interpretations are, we claim, both licensed by the propositional content of the Spanish article, both legitimate interpretations of the source language article, and yet result in quite different target language translations.

In this paper then, we examine in some detail the differences between two translations of a text, given in Appendix A. Both translations were professionally done by translators of approximately equal expertise. We will call them Tl and T2.

Our categorization is not a formal one based solely on observable differences. Instead, we attempted to develop categories based on our best guess as to the explanation for the differences. We found three basic categories of difference: differences due to error on the part of one or both translators; differences due to differing beliefs on the part of the translator, and differences which appeared to make no difference (free variation). In view of the dictum "no distinction without a difference," it seems plausible to us that some of the members of the free variation class may well ultimately be classified as belief-based differences.

We also distinguished three subtypes in the case of error (accidental errors, errors due to interference from the source language text, and errors in understanding) and two subtypes of belief-based differences (differing beliefs about the subject matter and differing beliefs about the target audience). In summary, out of 81 translation differences, we classified 13 as errors, 32 as free variants and 36 as belief-based. These categories and the results are discussed more fully in section 4.

3. Methodology

Our methodology was as follows. We first processed the Spanish text using the initial stages of CRL's Panglyzer Spanish analysis system (Farwell et al., 1994). This involved steps of breaking the text into words and sentences, and tagging each word and item of punctuation with an identifying (part-of-speech) tag and providing morphological analysis for each lexical item. We hand-corrected this output and then further processed the text through the Panglyzer phrase recognizes. This module groups words in the input text into small groups that are semantically and syntactically cohesive and unambiguous.

Then the two translations were cut up and fit to these chunks. In some cases where two Spanish chunks were translated by one indivisible English chunk, the two were combined. At the same time, some single chunks contained more than one error. These multiple errors were broken out. We also examined the two translations sentence by sentence to look for differences in syntactic structure that were not reflected within any particular chunk. We then examined each divergent translation unit (and each syntactic difference) for classification. These were then tabulated and are reported in the next section.

4. Results

In the first subsection, we report the basic statistical results. The second section deals individually with each type of explanation. The third section is devoted to the explanation of the differences based on beliefs.

4.1. Statistical results

In the original text there were 403 words and 439 tokens, including punctuation. There were a total of 218 chunks, after processing through the phrase recognizer of the Panglyzer system and hand correcting. Of these 182 were lexical chunks. After combining analysis chunks that were inseparable in the translations, we obtained 170 translation units, of which 66 (39%) contained translation differences. In these 66 units were 215 words, or 53% of the text. After subdividing the differences in chunks where there was more than one, there were 81 differences identified between translations.

We also identified 9 syntactic differences between the two translations, apart from the lexical/chunk differences. Three involved subject-verb reversal following a statement (the difference between *...said John,* and *...John said.).*

Two involved splitting a longer sentence into two shorter ones, one involved reversal of a main and subordinate clause, and three involved movement (fronting or embedding) of other constituents. These syntactic variants were also the cause of 8 chunk-level differences, such as the loss of a conjunction, replaced by a period. On the other hand, one syntactic difference (moving an adverbial phrase to the end of the clause) appeared to be the result of the chunk-level choice of using a phrase rather than a single-word adverb. Not counting these 8 chunk and 1 syntactic differences, then, there were a total of 81 differences, 73 of them chunk-related, and 8 syntactic differences.

4.2. Explanatory results

The basic results are summarized in the table below. The results are broken out by translation (if applicable). The final column is the number of instances that could be explained only by this category of explanation.

Type	T1	T2	Total
Errors	**7**	**6**	**13**
Unintentional	3	3	6
Interference	3	3	6
Wrong interpretation	1	0	1
Free Variation			**32**
Belief-based differences			**36**
Related to Source Text			30
Related to Target Audience			6

Errors. The error category was the smallest of the three classes of differences. This was to be expected since both translations were done by qualified translators. We identified three types of errors. First there were errors that we felt were unintentional or accidental in nature. T2, for instance, misspelled the word *coastal* twice and used *a* instead of *an* before a word beginning with a vowel. Tl corrected a source's name from Edgard to Edgar, and seems to have accidentally overlooked two phrases (whose content could not be reasonably recovered from context). The second type were errors or extreme awkwardness related to interference with the source language text. An example of this type of error would be the translation of the Spanish verb *criticar* with the English verb *criticize,* even though this verb cannot take an S-complement in English as it can in Spanish. We found only one example of the third class of error, where the translator

appeared not to have overlooked something but simply to have gotten it wrong. In this case, Tl did not recognize the scope of the adjective *superior* clearly indicated by the source text. Otherwise, the errors were split evenly by type and by translator.

Free Variation. The second category we examined was free variation. To some extent this is a flexible category. That is, at the strictest level, there were cases where we could see absolutely no differences in semantic content, connotations, style, register, or invited inferences. Of these we found at most about 7 cases, such as the use (or non-use) of a definite article with plural nouns, or writing out *eight* versus using the numeral *8,* or the use of *that* or *which* as a relative pronoun. At a less restrictive level, we included cases where there were differences between the lexical choices, but it was not clear that they could be related directly to differing beliefs about the text. An example here is the translation of *sectores* in *sectores costeros* as either *costal area occupants* or *costal sector occupants. Sector* has a slightly more military/formal feel that the word *area,* but not enough for us to classify this as a belief-based difference.

Belief-based Differences. In this category we placed all translation differences that we felt communicated substantially different information, enough so that the readers of the differing translations would have different ideas of the nature of the source text or the events described in that text. These differences, however, were not such that one could (on the basis of the source text) be labelled as simply wrong or incorrect. We subcategorized two types of belief-based differences. One subtype (of which there were seven instances) consisted primarily of instances of addition or alteration of information that we felt were related to beliefs of the translator about the target language audience. That is, information was added if it was felt necessary to communicate properly with the target audience. Or, information was deleted if it was redundant and could be recovered from context.

For example, the Tl translation of *el norte del país* is *northern Chile,* thus supplying the name of the country instead of the more literal translation of T2: *the country's north. 6* such cases were found. The second subtype of belief-based differences was differences that we thought could be accounted for on the basis of different beliefs of the translators about the events recounted in the source text or on the attitudes of the participants (including the source text author) about these events. There was a total of 30 such translation differences in this subtype, and in the next subsection, we will look more closely at these cases.

4.3. Belief-related differences related to the events described in the source text

We expected to find a certain number of cases where the different beliefs of the translators about the world (and therefore about the events described in the source text) influenced their translations. And indeed, of the 36 belief-based differences we identified, 29 of them were of this category. What we did not expect was that of these 29 differences, 21 reflected differing overall understandings of the relationship between the participants and the events. In following the argument in this section, it might be wise to read the original article and the two translations.

First we note an example of a belief-related difference that reflects both an idiosyncratic belief of the translator and also reflects their overall understanding of the event. For example, the phrase *una vez producido el sismo* is translated by T2 as *once the earthquake occurred* and by Tl as *once the tremor starts.* There are two differences here, one in choice of verb (occur versus start) and one in the choice of tense (past versus present). From the first choice, it can be deduced that T2 believes that earthquakes are point events in time, while for Tl an earthquake is an event that takes up some time. However, there is no corroborating evidence for this belief, nor does it seem to have any other implications for the interpretation of the text, such instances in the translations. From the choice of present tense, Tl can be seen as characterizing the

report of the media coverage as encouraging a view of the possible earthquake as an inevitable and fairly immediate event, while T2 can be seen as characterizing the media as simply reporting the scientific facts of the relationship between an earthquake and a following tidal wave. This difference in characterization of the media coverage can be related to different overall pictures that Tl and T2 have of the story.

Another interesting example involved the translation of *la repartición* as either *the (press) release* (Tl) or *the office* (T2). There are two senses of the Spanish word, one of which typically means a distribution or release, while the other (a South American dialectal variant) typically refers to a government department or office. Tl has chosen the first sense and thus (because there has been no previous mention of a release) forces the reader to infer the existence of a specific press release on the basis of the previous information about the office. T2 has chosen the second sense.

We now examine those differences that are related to differing overall viewpoints, but before we examine them in detail, let us look briefly at some of the structural and underlying elements in the text. The structure itself is fairly straightforward. Almost every statement is attributed to someone or some organization. The first four sentences are explicitly (or in the case of sentence 3, implicitly) attributed to (a report issued by) ONEMI, a government emergency agency. This report states that the local population was alarmed and acted unusually, and suggests the media of inadequate treatment of the scientific information. Sentences 6 through 9 are attributed explicitly to scientists (8 and 9 specifically to Edgard Kausel). Sentences 5,10, and 11 are unattributed statements of geographic, historical, and current facts.

From this outline, it can be seen that there are four actors already in the text itself: ONEMI, scientists, the populace, and the media. To answer the basic question of what the article is about requires an answer to the question of what the relationship among these four participants is. How do they view each other (if at all) and how do they differ in their beliefs, if at all? In particular, what is ONEMI's view of the activity of the media and the people? What is the scientists' view of the scope and imminent probability of an earthquake/ tidal wave combination?

After looking at the evidence, it seemed to us that the belief data support the following hypothesis. Translator T2 sees the ONEMI report as simply stating facts about intelligent (but unusual) behavior in the face of strong predictions of a future catastrophe. Translator Tl saw the ONEMI report as blaming the media for causing a panic among the populace in response to a minimal possible future happening. In both cases, the scientists' reports in the second half of the article are intended as confirmation of their particular view.

Given this hypothesis, we would expect to find the following data in translation differences: a) Translator Tl should play up irrational behavior of the people, while T2 should play it down; b) Tl should play down the seriousness the predicted catastrophe, while T2 should play it up. c) Tl should play down the likelihood of the catastrophe occurring, while T2 should play it up. And indeed we find this is the case.

A prime example of hypotheses (a) and (c) can be gleaned from the translations of the headline itself. The headline reads *Accumulation de víveres por anuncios sísmicos in Chile*. The two translations are *Stockpiling of Provisions because of Predicted Earthquakes in Chile* and *Hoarding Caused by Earthquake Predictions in Chile*. In the first translation, a rational activity (stockpiling) is based rationally (because of) on expectations of a future catastrophe (predicted earthquakes), while in the second, irrational, selfish behavior (hoarding) is related by a causal chain (caused by) to a speech act (prediction) about a hypothetical future event.

Other evidence for differing attitudes toward the behavior of the people includes: (1) claiming that purchases increased only *to an unusual degree* (T2), or *sharply* (Tl); (2) mentioning that ONEMI *was faced with an increased level of information-seeking phone calls* (T2) or *inundated...with phone calls* (Tl); (3) using the relative pronoun *who* to refer to the population (T2) as opposed to *which* (Tl). Also telling is Tl's expansion of the scope of the criticism in ONEMI's report from only the one criticism made in the text, to indicating a more general critical nature of the entire report. Similarly, ONEMI is credited with *admitting* (Tl) the existence of events which would cast doubts on its successful operation, rather than *acknowledging* (T2*)* an unusual occurrence.

Evidence for the claim of downplaying the significance of the catastrophe is Tl's use of the terms *tremor* or the (almost facetious) *quake* instead of *earthquake* (T2). T2's use of the descriptive adjective *large* in place of T2's *great,* and Tl's description of the tidal wave as *as much as 20 meters high* sounds less formidable than T2's *of up to 20 meters high.*

Evidence for the third hypothesis, about the possibility or likelihood of the catastrophe and any legitimate cause for concern can be found in the propositions that the tidal wave *may affect* (Tl) the country, as opposed to T2's *would affect.* Tl describes the frequency of such earthquakes as *on the order of a hundred years,* giving a much greater range than T2's *approximately every one hundred years.* The instruments set up by the Chilean authorities will record *any possible increase* (Tl), (cf. T2's *a possible increase), in advance* of (Tl), (cf. T2's *on the eve of)* of a *predicted* (Tl) (cf. T2's *announced)* earthquake. Thus for Tl, the scientists view the earthquake as only a possibility, with effective advance warning systems in place, while T2 views the scientists as suggesting a stronger likelihood of the earthquake's occurrence and an ineffective warning system.

There is contradictory evidence only to hypothesis (a) and then only in two translation units, Tl quotes the ONEMI report as referring to the people's *concern* whereas T2 uses *confusion* to describe their mental state. Tl quotes ONEMI officials as talking about the people *engaging in the feverish purchase of foods,* while T2 describes them as *unleashing a food-buying fever.* T2's translations here seem to paint the populace as more irrational than Tl's. But of the 21 translation differences related to global perspectives on the participants and their motives and behavior, all but these 2 either support or do not contradict this hypothesis.

5. Pragmatics-based Model of Translation

In this section, we present a pragmatics-based model of translation, and show how it can be used to produce the translation variants described above, in particular the headline translations.

A pragmatics-based model of translation relies on the use of context for interpreting source language utterances and producing target language correlates. Context as we see it is defined in terms of nested beliefs environments (or spaces) which are constructed or modified through ascription as the communicative interaction unfolds. The beliefs in these environments are ultimately supported by the translator's knowledge of the world which is accessed during processing in order to maintain contextual coherence. Context-sensitive (non-monotonic) inferencing within these environments plays a central role in assigning an interpretation during analysis or to formulating expressions during production (see Barnden et al., 1994).

The process of translation involves four agents (individuals or groups): the source language speaker/author, the source language addressee, the translator and the target language addressee. Each agent brings to this process a partial knowledge of the world, organized in an individual way, not only about the individuals,

objects, situations and events that become the topic of conversation but about the setting of the communicative interaction as well; the participants, the surroundings and the linguistic, social and cultural convention. Some of these beliefs are assumed to be commonplace or typically shared with the other participants and some of them are not. In either case, they are attributed to the others as needed, providing the broad (discourse) context for the communicative interaction.

Each agent also has beliefs about the (explicit) information made public during the course of the interaction along with further (implicit) information that has been inferred in order to establish contextual coherence. These beliefs provide the narrow (utterance) contexts for formulating and uttering expressions or for interpreting the utterances (acts) of others.

Figure 1 presents a schematic view of the utterance context for interpreting the news article discussed in Section 4. We follow a convention introduced by Wilks and Ballim (Ballim & Wilks,1990) and indicate beliefs **about** a topic by naming the topic on the upper line of the box, and beliefs **of** a believing agent by naming the believer on the lower line of the box. The utterance context consists of a complex beliefs environment representing the translator's viewpoint and having embedded viewpoints for the author and the Spanish-speaking readers of the article. B_i^t is a belief of the translator about some aspect of the topic of discourse which has been ascribed to the author and the reader
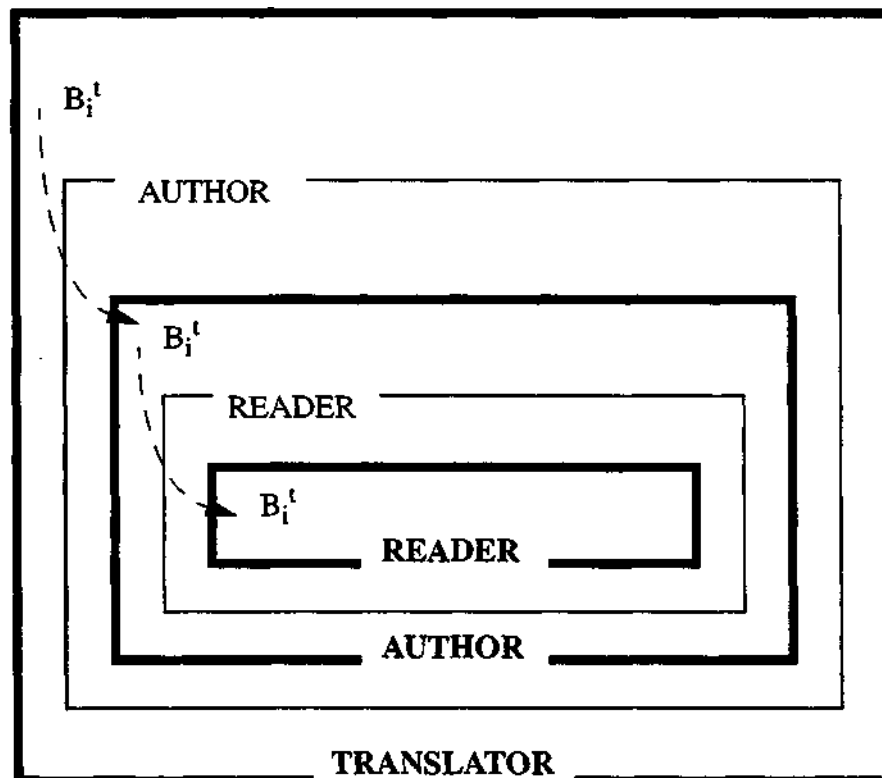

FIGURE 1. Schematic Utterance Context for Interpretation

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As each source language utterance is processed, the system constructs a set of semantic representations for the expression uttered corresponding to its possible readings. This is carried out using a standard compositional procedure without reference to the utterance context. For instance, among the possible readings for *acumulación de víveres* in the text headline might be **gathering** or **piling up of provisions or supplies.**

The next step is to accommodate these readings into the utterance context using default inferencing. This is done by independently ascribing each reading to the environment representing the translator's view of author's beliefs about the topic and observing the transparency of the inferencing involved in establishing a coherent connection between the ascribed belief and the existing beliefs.

In this case, the translator's view of author's beliefs about the situation described in the text is either one of people behaving rationally by preparing themselves for the after effects of an immanent earthquake or one in which people are behaving irrationally by preparing themselves for the unlikely event of an earthquake. Under either scenario the translator would assume the author is referring to the **gathering of provisions** rather than to the literal **piling up of supplies** as the former is an activity related to preparing for times of difficulty while the later is not. At this point, we have a candidate interpretation of the expression that is contextually coherent along with the assumptions and inferencing that was used to establish that coherence.

But it is also possible that the translator would relate the interpretation even more closely to the context. For instance, under the first scenario the translator might assume that the author was referring to a **stockpiling of provisions** since this would be a rational form of **gathering.** Under the second scenario, on the other hand, the translator might assume that the author was referring to a **hoarding of provisions** since this would be an irrational form of **gathering.**

At this point, the translator's task is to perform a target language utterance whose interpretation will result in a change in the beliefs environment of the audience of the translation which parallels the change in the beliefs environment of the source language readers

The first step in this process is for the translator to assume the viewpoint of the author of the source language text. This is done by ascribing the author's viewpoint to the translator and by ascribing the Spanish-speaking readers' viewpoint to the English-speaking audience of the translation. The resulting context is similar to Figure 1, with the Author and Reader boxes replaced by Audience boxes..

During this process, certain interpretations or supporting inferences may be blocked should they contradict existing audience beliefs or be atypical of the audience. That is, if the beliefs necessary for establishing a coherent connection between a **hoarding of provisions** and the utterance context contradict existing beliefs in the audience environment or are atypical of the target audience, then those beliefs cannot be ascribed and the **hoarding of provisions** interpretation will be blocked. In such cases, coherence must be reestablished during generation on the basis of the audience's viewpoint.

The resultant beliefs environments approximate to the greatest degree possible the contexts before and after the source language utterance. Communication of the difference between the two contexts, that is, the interpretation **(gathering** or **stockpiling** or **hoarding of provisions)** along with the specific inferences that supported it, becomes the goal of the utterance to be produced. The planning of the utterance and the realization of an appropriate expression is then carried out with reference to the context made as needed to accommodate any implications associated with specific target language choices which go beyond the context.

6. Implications

We have presented an analysis of translation variants in one text and described a pragmatics-based model of translation and which can be used for explaining these differences. The model provides a rich framework for defining a notion of translation equivalence which is based on the translator's view of beliefs of the participants in the communicative interaction.

6.1. Evaluation

From the perspective of a pragmatics based model of translation and in view of the widespread and significant translation variants to be expected from both human and machine translation systems, it should be clear that the focus of evaluation should be on (1) the total organization and contents of the utterance context in the target language interaction, the beliefs of the participants and the inferences performed, and its similarity and difference with the corresponding context of the source language interaction, and (2) on the naturalness of expressions of the target language context. It should also be clear that there are is a large range of potentially appropriate translations for a given interaction given that variations arise from differences in participants' beliefs and that every participant (translator, author, reader and audience) has a different and incomplete knowledge of the individuals, objects, situations and events referred to in a communicative interaction as well as of the components of the interaction itself.

This being the case, it makes an automatic evaluation process essentially impossible (unless one can develop an omniscient observer) and makes the development of an objective evaluation extremely difficult. Nonetheless, an evaluation of the sort set up for the ARPA MT program (White, et al) makes sense. Readers of the source language text and of the translation should be given comparable comprehension tests before and after reading the text, crafted to avoid linguistic cues to those texts, and the results compared. Both groups of readers should preform better after reading the text and successful translation should lead to similar patterns of responses. Independently, translations should be reviewed from the standpoint of naturalness, well-formedness and readability.

6.2. Translation

With respect to translation, a pragmatics-based approach provides a much more explicit framework for reasoning about the many choices that translators must make in producing a translation. But the central assumption of the approach is that language is vague and texts radically underspecify the interpretation. This is why translators must interpret utterances against a context of beliefs about the world, about the components of the utterance context, and about the topic and related individuals and states-of-affairs. A linguistic text or expression does not pick out anything. Rather speakers use texts or expressions to guide addressees in picking out individuals or establishing a version of events which the speakers hope, if not expect, to parallel their own but which, in fact, frequently do not.

In any case, a pragmatics-based approach to translation would have translators discover all they can about the discourse and utterance contexts of the source language interaction, identify the most likely scenario in which the author and reader would be involved in a communicative interaction in the first place and identify the most likely scenario in which the translator and the audience of the translation would be involved in a communicative interaction. Then track, utterance by utterance, what the author could be intending to communicate, how it is communicated including any supporting inferencing, and why the author would want to communicate it at that point and in that way. It is this information that both guides and constrains

the creation of the target language text which is essentially an attempt to recreate, under clearly different circumstances, the same chain of events.

6.3. Machine translation

We feel that a pragmatics-based approach to MT offers the only direct assault on the issues raised by Bar-Hillel as early as 1959 (Bar-Hillel, 1960). It is not simply that MT systems need knowledge, they need to be able to create complex structures of beliefs and to be able to reason within those structures in order to arrive at an appropriate interpretation in spite of incomplete or possibly inconsistent knowledge. To ignore this fact is to delay progress on both theoretical and applied MT.

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I. Original Text

Acumulación de víveres por anuncios sísmicos en Chile

La población de la ciudad portuaria chilena de Antofagasta incrementó inusualmente sus compras de víveres y artículos esenciales, alarmada por anuncios sobre un terremoto acompañado de salida de mar que afectaría el norte del país y el sur del vecino Perú en cualquier momento, admitió la gubernamental Oficina de Emergencias (ONEMI).

La posibilidad de un remezón desastroso, considerada cierta por la comunidad científica al cabo de un 'silencio sísmico' que se prolonga más de cien años, tuvo un tratamiento inadecuado en recientes versiones periodísticas, que provocaron pánico y desconcierto entre los habitantes, criticó la repartición.

Algunas radios y diarios advirtieron que una vez producido el sismo, los ocupantes de sectores costeros tendrían no más de quince minutos para huir a los cerros y escapar de una inevitable y devastadora ola marina de hasta 20 metros de altura.

ONEMI se vio enfrentada a un elevado nivel de llamadas telefónicas de consultas de la población que, asimismo, desató una fiebre de compras de alimentos en el comercio, dijeron funcionarios.

Antofagasta, sobre el Pacífico, 1100 km al norte de Santiago, cuenta unos 226 mil habitantes y se alza entre la orilla marítima y la alta planicie del desierto septentrional.

El norte chileno, cuyos otros dos grandes centros urbanos de costa, además de Antofagasta, son Arica (170 mil habitantes) e Iquique (152 mil), podría ser escenario de un terremoto de más de ocho grados Richter en el futuro cercano, según las observaciones científicas.

El sismo será causado por una 'gran ruptura' de las capas geológicas provocada por la milenaria y profunda penetración de la placa submarina de Nazca por debajo del continente sudamericano, indican los informes.

No se pueden predecir la fecha ni el epicentro, así como tampoco es posible pronosticar los efectos, dijo el Director del Departamento de Geofísica de la Universidad de Chile, Edgard Kausel.

Pero es sabida la periodicidad de los terremotos de magnitud e intensidad superiores en esos territorios, aproximadamente cada cien años, agregó.

El último gran sismo seguido de maremoto se registró allí en 1877 y afectó principalmente a la ciudad de Arica, junto al límite con Perú.

En las pasadas dos décadas, las autoridades chilenas y organizaciones científicas locales y extranjeras han establecido numerosos sistemas de medición de movimientos de tierra y cambios en la corteza, para registrar un eventual aumento de la sismicidad en la zona, en vísperas del anunciado terremoto desastroso.

II. Translation Tl

Hoarding Caused by Earthquake Predictions in Chile

The population of the Chilean port city of Antofagasta increased sharply its purchases of provisions and essential articles, alarmed by announcements regarding an earthquake accompanied by tidal wave which may affect northern Chile and the south of neighboring Peru at any moment, admitted the government Office of Emergencies (ONEMI).

The possibility of a disastrous tremor, considered certain by the scientific community in the wake of a hundred-year prolonged "seismic silence," was inadequately treated in recent news stories, which provoked panic and concern among inhabitants, said the release, which was critical of the media.

Some radios and newspapers warned that, once the tremor starts, coastal sector occupants would have no more than fifteen minutes to flee to the hills and escape an inevitable and devastating tidal wave as much as 20 meters high.

ONEMI has been inundated itself, with telephone calls from the population which, at the same time, is engaged in the feverish purchase of foods in the markets, said personnel.

Antofagasta, on the Pacific, 1100 km north of Santiago, has some 226,000 inhabitants and lies between the seashore and the high plateau of the northern desert.

There are two other large coastal urban centers, in addition to Antofagasta: Arica (170,000 inhabitants) and Iquique (152,000) in the Chilean North, which could be the scene of an earthquake of more than eight points on the Richter scale in the near future, according to scientific observations.

The earthquake will be caused by a "large rupture" of geological layers provoked by the thousand-year-old, deep penetration of the Nazca submarine plate under the South American continent, say the reports.

Neither the date nor the epicenter can be predicted. Neither is it possible to prognosticate the effects, said the Director of the Geophysics Department of the University of Chile, Edgard Kausel.

But the cyclic nature of earthquakes of magnitude and high intensity in these territories is known to be on the order of a hundred years, he added.

The last large quake followed by a tidal wave was registered there in 1877. It principally affected the city of Arica, close to the Peruvian border.

Chilean authorities and local and foreign scientific organizations have established numerous systems over the past two decades to measure earth movements and changes in the crust to register any possible increase in seismic activity in advance of the disastrous earthquake predicted.

III. Translation T2

Stockpiling of Provisions Because of Predicted Earthquakes in Chile

The population of the Chilean port city of Antofagasta increased its purchases of provisions and essential articles to an unusual degree, alarmed by announcements about an earthquake accompanied by rising seas that would affect the country's north and neighboring Peru's south at any moment, the governmental Office for Emergencies (ONEMI) acknowledged.

The possibility of a disastrous tremor, considered certain by the scientific community at the end of a "seismic silence" lasting more than one hundred years, received inadequate treatment in recent newspaper versions, which provoked panic and confusion among the inhabitants, criticized the office.

Some radios and newspapers warned that once the earthquake occurred, costal area occupants would have no more than fifteen minutes to flee to the hills and escape from an inevitable and devastating tidal wave of up to 20 meters high.

ONEMI was faced with a increased level of information-seeking telephone calls from the population who, in addition, unleashed a food-buying fever in the shops, officials said.

Antofagasta, on the Pacific, 1100 km to the north of Santiago, has some 226,000 inhabitants and rises between the maritime shore and the high plateau of the northern desert.

The Chilean north, whose two other large costal urban centers, in addition to Antofagasta, are Arica (170,000 inhabitants) and Iquique (152,000), could be the scene of an earthquake of more than 8 points on the Richter scale in the near future, according to scientific observations.

The earthquake will be caused by a "large rupture" of the geological layers caused by the millenary and deep penetration of the Nazca underseas plate beneath the South American continent, the reports indicate.

Neither the date nor the epicenter can be predicted, any more than it is possible to foretell the effects, said the Director of the Geophysics Department of the University of Chile, Edgar Kausel.

But the periodicity of earthquakes of superior magnitude and intensity in those regions is known, approximately every one hundred years, he added.

The last great earthquake followed by a tidal wave was recorded there in 1877 and primarily affected the city of Arica, next to the border with Peru.

In the past two decades, in order to record a possible increase in earthquake likelihood in the area on the eve of the announced disastrous earthquake, Chilean authorities and local and foreign scientific organizations have established numerous systems for measuring earth movements and changes in the crust.